Examination on Differentiating Characteristics for Securitizing and Non-Securitizing Banks in the U.S.A.

Zhang Xixi

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Certificate of Originality

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Signature: Zhang Xixi 張晰晰
Date: 2005-10-1

Name: Zhang Xixi
Student ID: S03079670

ABSTRACT

This thesis is focused on comparing financial characteristics of securitizing banks and non-securitizing banks. Test results show that a bank's liquidity risk, loan portfolio quality, funding cost, profitability and efficiency ratios are significantly correlated with securitization volume whereas portfolio quality, funding cost and profitability are related to securitization volume. Securitization activities are concentrated in large banks in terms of assets size. But when combined with other characteristics, size factor lost significance in relation with securitization level. Capital adequacy ratios are higher for non-securitizing banks than securitizing banks. Those findings can help banks and regulators in understanding how operational characteristics motivate securitization. Bankers can understand the circumstances under which they and competitors benefit from securitization. Regulators can conduct better monitoring of securitizing banks according to the operational and capital requirements.

摘要

本文著重于比較實施資產證券化與未實施資產證券化的銀行之間的財務特徵。檢驗結果顯示銀行的流動性風險，貸款組合質量，集資成本，盈利情況以及運作效率與是否證券化決定之間存在顯著的關聯。而貸款組合質量，集資成本，以及銀行的盈利情況影響著證券化的規模。資產證券化的活動集中于総資產相对比较大的一些銀行。但是當加入銀行的其他特徵一起研究時，銀行総資產的大小失去了對證券化規模的決定作用。此外，本文發現實施證券化的銀行的資本充足率高於不實施證券化的銀行。以上發現有助於銀行以及相關監管者了解銀行的營運特徵如何鼓勵資產證券化行爲。由此，銀行將了解在怎樣的狀況下其本身及其競爭对手會通過資產證券化活動獲利。與此同時，針對新巴塞爾資本協定中對於營運及資本要求，監管者可更好地對資產證券化銀行進行監督。

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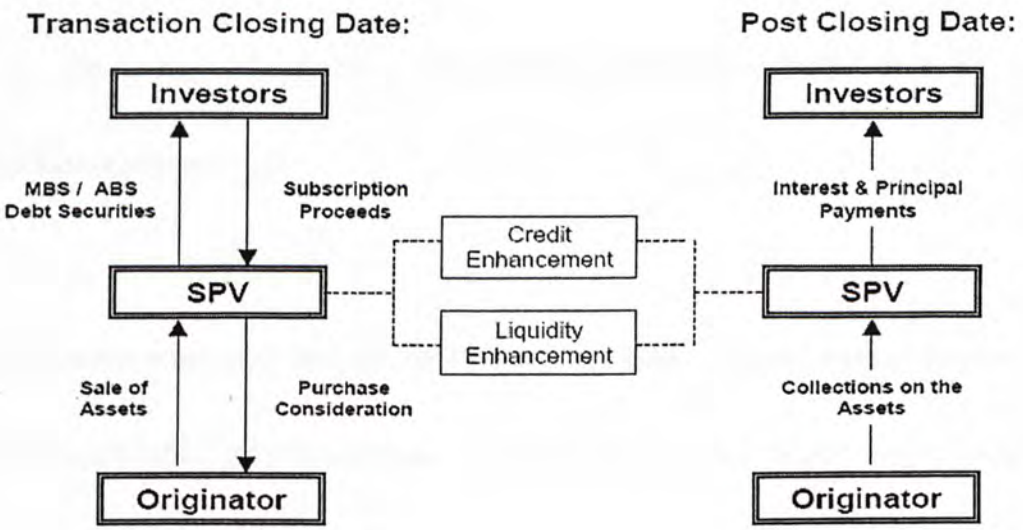
I. Introduction

Securitization[1] is the process by which homogeneous illiquid assets are pooled and repackaged, with security interests representing claims to the incoming cash flows and other economic benefits generated by the loan pool sold as securities to third-party investors.

The diagram below illustrates the securitization process.



This diagram shows three main categories: Originator, Special Purpose Vehicle (SPV), and Investors. The originator of assets sells a portfolio of assets to an insolvency remote SPV. The SPV funds the acquisition of these assets by applying the subscription

[1] There are two major types of classifications by assets: asset backed securities backed by non-mortgage and mortgage backed securities. However, as to the wide definition, both types are backed by assets and thus all securities at the end of securitization process are asset backed securities. The thesis uses the wide definition that Asset Backed Securities (ABS) refers to both securitization issues backed by all types of assets, mortgage and non-mortgage.

proceeds received from the issue of debt instruments. Thereafter, the principal and interest receipts on the assets are used to make payments of interest and principal on the debt securities. Various liquidity and credit enhancements are put in place to ensure that the SPV can make timely payment of interest and ultimate repayment of principal to investors.

Securitization creates value by increasing liquidity, reducing or reallocating credit risk, diversifying portfolios, improving leverage ratios, or reducing the level of regulatory capital required. As banks are changing their function from taking traditional deposit and lending to originating and servicing, securitization plays an essential role for the disintermediation process.

Securitization originated back in the 1970s. Since then US asset backed securities have experienced rapid growth and have aided in creating the largest single capital market in recent decades. Total volume outstanding of asset backed securities in US reached US$ 9 trillion in year 2004 and that of non-mortgage asset backed securities was US$ 1 trillion.[2]

The Basel committee, an international banking supervisory organization set up two

[2] From www.bondmarket.com

important accords Basel I (1988) and Basel II (2004). Basel I set out minimum capital requirements for banks. As for Basel II, regulators created an "Internal Ratings-Based Approach" in addition to the standardized approach to assess the regulatory capital requirements for credit risk. The Internal Rating-Based Approach also goes into great detail on calculating capital required for ABS. This approach aligns the treatment of securitization-related exposures more closely to industry practice by mapping their internal risk assessments to external credit ratings. The Basel II set operational requirements and treatment of securitization exposures related to credit and liquidity risk. It ensures that capital charges are more sensitive to risks of exposures in the banking book.

The implementation of Basel II in 2006 requires a clear and in-depth understanding of banks' risk and operational characteristics and how they differ between securitizing and non-securitizing banks is important to regulators.

This thesis will present an updated overview of securitization for US banks at present and examine financial characteristics of securitizing and non-securitizing banks. Using data from the last quarter of year 2004 of US banks, I will identify characteristics that differentiate securitizing from non-securitizing US banks. I will also quantify how they are related to the decision whether a bank securitizes and if it does, how much it

securitizes. With the test results, I will

1. Have a close-up and comparison at financial characteristics of securitizing and non-securitizing banks
2. Find out relation between financial characteristics of the banks and their securitization decision and volume to securitize
3. Shed light on motives and benefits of securitization

This thesis will start with literature review. In the third section, I will explain and discuss the hypotheses and test design. Section four will discuss on the data and findings. Section five will be the results. Last section is conclusion and insights on future research.

II. Literature Review

This section will review previous research about relations between bank characteristics and securitization. I will focus especially on the work of Obay (2000), which is the most complete description in the literature to date of the differences between securitizing and non-securitizing banks.

Various scholars propose motives for and benefits from bank securitization, thus provide a basis for constructing hypotheses in this thesis.

Regulatory capital saving

Obay (2000) discusses that banks below or approaching the minimum capital level have an incentive to "off-load" their balance sheet. Banks do this "off-loading" by repackaging their booked loans into tradable securities. This thereby results in a reduction in the size of their assets enabling them to meet the capital requirements.

Regulatory capital arbitrage

Calem and LaCour-Little (2004) demonstrate that there is incentive to securitize the

least risky loan as regulatory capital levels are too high for most mortgage loans. They find capital required for banks to match the insolvency probability of a BBB-rated commercial bond is generally lower than current regulatory standards. For example, they calculate a newly originated mortgage loan with 80% loan-to-value ratios and a prime borrower credit score of 700[3] require very little capital to cover credit risk (no more than .51% in a well-diversified portfolio and .9% in a regionally concentrated portfolio) assuming a BBB solvency standard on an eight year horizon. However, current capital rules assign a 50% risk weight to most residential mortgages, thus requiring a 2% tier I capital ratio. The "one size fits all" approach of capital requirement particularly striking in Basel I thus appears to promote the use of securitization, and the process is called "regulatory capital arbitrage".

For example, assume a bank with $100 of loan risk weighted at 100% and $200 of mortgage risk weighted at 50%. Thus risk-weighted assets on the balance sheet is $100*100% + $200*50% = $200. Assume the bank has exactly the minimum 8% capital required, i.e., $16. Now imagine the bank securitizes its mortgages and the SPV requires a 2% of subordinate tranche. After selling the mortgage loans, the SPV has $200 mortgage as assets whereas $196 are of rated securities and $4 retained as unrated. The

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[3] Defined by Feddie Mac, the credit score is the one selected from all usable credit scores obtained for an individual borrower that quantifies the credit reputation risk for that individual borrower. A credit score of 700 means the borrower has an acceptable credit reputation.

originating bank thus has $100. $4 is required to be subtracted from the $16 capital as credit support for the asset backed securities. As a result, $12 is left as the capital over assets of $100 at 100% risk weighted. This leads to a total risk-based capital ratio of 12%. This process results in the capital ratio rising from 8% to 12%.

Ambrose, LaCour-Little and Sanders (2003) apply a competing risks model to obtain the unbiased expectation of borrowers' prepayment and default risk. Their results show that securitized mortgage loans experience lower ex-post defaults than those retained in portfolio. Since regulatory arbitrage story implies that high risk loans are retained while low risk loans are securitized, there should be a positive relationship between expected default probability and the probability of retaining the loan in portfolio. That is, higher risk loans as revealed by higher expected default probabilities are more likely to be retained in the portfolio. Thus, their finding supports the argument that capital requirements have an incentive to sell lower risk and retain higher risk assets in portfolio.

Bankruptcy cost avoidance

Bankruptcy costs are the cost related to liquidating assets, attorney fees, and filing fees during the bankruptcy process. An SPV is designed to be entity that never goes bankrupt because bankruptcy would give no advantage to senior creditors. SPVs are

transformation devices instead of entities with substance. With the exception of the securitized assets they have no assets or incomes. The SPV is a legal shell with only the specific assets transferred by the originator, and those assets are either beneficially held by the investors, or collateralize the securities of the SPV. There is nothing that is left in SPV for anyone to have an interest in it. In other words, nobody wants the SPV to go bankrupt. The bankruptcy-remote characteristic for the holder of assets makes its value from the point of view of its claimants independent of the bankruptcy of a related third party especially the asset seller. The SPV that purchases the assets with new securities proceeds is bankruptcy-remote from the originator, such that in the event of the originator's bankruptcy, the claimant of the originator would have no recourse to the assets sold to the SPV.

There is another story about bankruptcy cost minimization by separation. Modigliani and Miller (1958) state that in a world without tax and bankruptcy cost, the value of the firm is not affected by a change of capital structure. Many researchers prove that with bankruptcy costs, capital structure matters. Leland and Skarabot (2003) design a "merger-separation" model to compare the values of separate and merged firms and apply it to securitization. They argue that securitization as a separation activity from originator (bank) to the SPV allows each entity to have its own appropriate capital structure. As assets being securitized are transferred to the bankruptcy-remote SPV, the claimant of the

originator would have no recourse to the securitized assets in the SPV regardless of the financial distress or bankruptcy of the originator. The originator has limited liability and its debt has recourse only to its own cash flow and assets. If the activities for the bank and SPV are notably different in terms of risks or default costs, their optimal leverage ratios may also vary significantly.

Leland and Skarabot show that under plausible assumptions, the benefit of asset securitization versus keeping the assets inside the firm is a negative function of the volatility of the securitized assets. They model the cash flow and firm value and find the higher the quality of the assets securitized, the higher the benefits it brings. The originator ends up with lower leverage ratio and more risky assets remaining within the firm while the SPV has the optimal leverage ratio and lower rate on borrowing. The overall outcome is weighed a higher leverage.

Through a simulation, they show separation is beneficial because it allows substantial differences in leverage appropriate for the separate entities, i.e., originator and the SPV. It predicts that asset securitization will be desirable for assets with stable cash flows and low default costs relative to the originator. In other words, banks choose to securitize better quality assets and retain poor quality assets on balance sheet.

Saving funding costs

Pennacchi (1988) shows that securitization allows some banks to finance loans less expensively than by traditional deposit or equity issue. This is because bank funds being received via loan sales can avoid costs associated with required reserves and required capital. By selling loans (securitization), banks can raise funds at the same cost as deposits but the funds acquired through loan sales (securitization) do not appear on the balance sheet of the bank. The ratio of the prices for debt and equity equals the ratio of the certainty-equivalent rate of return on equity versus debt. The certainty-equivalent rate of return of equity is higher than debt and thus the price for equity is more expensive than debt. Therefore, the bank will not be required to issue more relatively expensive equity in order to stay within its capital adequacy constraint or be required to hold non-interest-paying reserves against these funds. Obay also discusses that funds collected through securitization are free from deposit insurance and reserve requirements. He also states that banks experiencing shortages of funds may be forced to borrow intermediated funds with higher interest rate. Thus to lower funding cost is assumed as one motive for securitization.

Increasing liquidity

Ambrose, LaCour-Little and Sanders (2004) demonstrate that securitization increases liquidity for originator for different modes. For the agency swap program[4], the originator receives a liquid asset in the form of a mortgage-backed security. Under the cash program, the originator has cash proceeds to reinvest, either in additional mortgage lending or in alternative liquid instruments.

Improving management efficiency through specialization

Obay also states that the larger the size of the bank, the higher the level of sophistication of the management team to be more capable of carrying out the complicated process of securitization. Also securitization usually requires high set-up costs that could be more likely to occur in large banks because of economies of scale.

Information asymmetry/ Resolving information asymmetries

Casual observation of securitizations shows that banks retain loans with a high degree of information asymmetry and sell ones with a low degree of information asymmetry. Greenbaum and Thakor (1987) construct a theoretical model that shows that given an asymmetric information environment without government intervention, banks

[4] A method of securitization in which single family residential mortgages conforming to agency underwriting guidelines are swapped for mortgage-backed securities issued by Fannie Mae or Freddie Mac.

would favor securitization for the best assets and deposit funding for the worst. Assuming risk neutral banks and risk-averse investors, they define and compare the following two funding modes. Deposit funding mode is a risky debt contract that the entire bank's capital secured the loan whereas securitized funding mode would only require partial insurance coverage by the bank as a guarantee against loan default.

As the first step, they assume a world without deposit insurance, regulation and asymmetric information. This means the probability of loan pay-off is common knowledge among borrower, originator (bank) and investor. They find deposit funding mode and securitized funding mode are Pareto equivalent. Because under symmetric information environment, the optimal risk sharing arrangement for risk averse investors calls for all of the bank's capital to be made available to secure the loan. Thus, in equilibrium the borrower will set its insurance coverage on the loan at the maximum permitted by the bank's capital which makes the securitized funding mode contract identical to the deposit funding mode contract.[5]

Next, they consider the existence of information asymmetry (which means only the borrower gets access to the pay-off probability). The proof is in two parts. First, they prove that in equilibrium borrowers with higher success probabilities choose strictly

[5] For detail of the proof, please refer to Greenbaum and Thakor (1987) appendix

higher level of insurance coverage under the securitized funding mode. This is because the cost of insurance to the borrower is the premium paid at the outset, whereas the benefit is the reduced interest to be paid. The borrower pays this interest only if its project is successful, an interest reduction is more valuable to a borrower with a higher success probability. Thus, higher quality borrowers enjoy higher expected utility directly led by higher success probability.[6]

Secondly, they prove that in the equilibrium information screening cost for borrower is higher under deposit funding mode than that for securitized funding mode. It avoids direct investor screening costs, because borrowers signal their quality with amount of insurance coverage. And as shown in the last paragraph, highest quality borrowers obtain highest insurance coverage available from the bank's capital. Therefore, a borrower obtaining as much coverage under the securitized funding mode as under the deposit funding mode would prefer the former. Thus they come to the conclusion that with asymmetric information, the best assets are securitized and the worst are funded with deposits.

Demarzo and Duffie (1999) demonstrate how the presence of information

[6] There's a second reason: as a higher quality borrower chooses greater insurance coverage in equilibrium, providing risk-averse investors with better risk sharing and thus lowering the yield on the securitized loan. For the detail of the proof, refer to Greenbaum and Thakor (1987) p 382-292 Journal of Banking Finance.

asymmetries encouraged securitization. Assuming the originator is better informed about the credit quality of the borrower than the investor, the investor may set credit standards higher than the ones of the originator in order to protect himself. At the time the mortgage backed security is issued, the originator private information regarding the payoff of the security may cause illiquidity in the form of a downward-sloping demand curve for the security and the optimal strategy is to retain a portion of the asset in portfolio. It implies that if the originator does not wish to retain any portion of the mortgage backed security then she should sell the loans having the lowest degree of asymmetric information and retain those loans with higher risk.

A review on Obay's research work:

Obay (2000) uses financial ratios as measures to examine financial characteristics of 200 largest commercial banks that securitized during the year 1994-1995 reporting period. He points out the non-mortgage market for asset securitization is highly concentrated and dominated by credit card installment loans. Levels of securitization have great disparities ranging from less than 4 thousandths of a percent to 166% of total assets.

He tests financial characteristics for securitizing and non-securitizing banks at both multivariate and univariate level. He finds the two groups of banks differ on an overall

base. At the univariate level, adopters and non-adopters of securitization differed in terms of assets, wholesale business, risk-based capital ratio, deposit to loan ratio, securitizable loan ratio and previous year's securitization level. None of the cost, return or portfolio variables are found to significantly differentiate between the two groups. It means that securitizing banks were neither more profitable, more cost efficient, nor better diversified than non-securitizing banks.

Obay also examines the relation between securitizing volume and the characteristic variables. He points out that bank characteristics, measured by bank size and the ratios of international banking and wholesale business, have no weight on the securitization decision; neither did capital requirements. Instead, the decision as to how much to securitize is dictated by operational consideration (cost, return and liquidity), loan origination comparative advantage, and familiarity with the technique of securitization, that is prior involvement with the technique.

This thesis seeks to update and improve Obay's examination of the differentiating characteristics in securitizing and non-securitizing banks. However, instead of examining bank characteristics at the commercial bank level, this thesis will study the data concerning the bank holding company level. Obay applies the data from the years of 1994 and 1995 while this thesis is using the most recent data from the last quarter of year

2004. Instead of bank characteristics such as level of wholesale and international business, this thesis will include more operational characteristics such as efficiency ratios and portfolio composition. Obay only compares the mean difference between the two groups. This thesis applies a logistic regression to model the decision to securitize or not. This facilitates to reveal the relationship with both sign and magnitude. Furthermore, Obay puts all characteristics variables into a linear regression equation which encountered serious multicollinearity problems. In my paper, before the regression is carried, I test the correlations and drop the characteristic variables with serious correlations.

III. Hypotheses and Design of the Tests

A. Hypotheses

In this thesis there are three questions to be answered:

1. How do securitizing and non-securitizing banks differ based on bank characteristics?
2. How does each characteristic jointly correlate with the decision to securitize?
3. What is the relationship between bank characteristics and degree to which the bank uses securitization? Given a bank decides to securitize, what factors are linked to the amount of securitization?

This section of the paper will describe the tests to investigate these questions and the hypotheses relating to previously discussed literature. Following this section I will break down the above three questions of the hypotheses. I choose three different statistical tests to answer each question. I will also discuss the logic for choosing them, as well as assumptions and difficulties addressed during the tests.

I hypothesize that securitizing and non-securitizing banks are different based on liquidity risk, loan portfolio quality, portfolio composition, regulatory capital ratio, funding cost, efficiency ratio, profitability and size; these characteristics are related to bank's decision to securitize and degree of securitization.

Table 1: The expectation for each characteristic

Bank characteristics	Difference between securitizing and non-securitizing banks*	Relation with securitization decision	Relation with degree of securitization amounts of securitizing banks
Liquidity risk	Higher	Positive	Positive
Loan quality	Lower	Negative	Negative
Regulatory capital ratio	Lower	Negative	Negative
Funding cost	Higher	Positive	Positive
Efficiency ratio	Higher	Positive	Positive
Profitability	Higher	Positive	Positive
Size	Higher	Positive	Positive
portfolio composition	Higher**	Positive	Positive

*ratios are higher or lower for securitizing group

**the more securitizable loans there are, the more likely the bank is going to securitize

In this section, I will discuss how the theories and research I have examined in the literature review lead to my hypothesis. Each characteristic is measured by financial ratios, introduced later.

Liquidity risk

As an alternative funding mechanism, securitization brings liquidity (Ambrose, LaCour-Little and Sanders, 2004) to originator. Higher liquidity need is an important motive for banks to securitize. Simply put, liquidity risk is supposed to be higher for

banks adopting securitization. A positive relation is thus expected between liquidity risk of the bank and decision or degree of securitization. The effort of securitization is to decrease liquidity risk by increasing liquidity. The securitizing bank would be thus more liquid than the same bank without securitization. But as securitization is a costly liquidity source, thus less liquid than one without liquidity need for securitizing.

Portfolio quality

Resolving information asymmetry, regulatory arbitrage and bankruptcy cost avoidance stories all predict that the best assets are to be securitized and the poor assets remain as deposit funding. Ambrose, LaCour-Little and Sanders (2003) apply a competing risks model to obtain the unbiased expectation of borrowers' prepayment and default risk. Their results show that securitized mortgage loans experience lower ex-post defaults than those retained in portfolio. Since information asymmetry story implies that high risk loans are retained while low risk loans are securitized, there should be a positive relationship between expected default probability and the probability of retaining the loan in portfolio. That is, higher risk loans as revealed by higher expected default probabilities are more likely to be retained in the portfolio. Thus, their finding supports the argument that banks have incentives to sell lower risk and retain higher risk assets in portfolio.

Loans with higher default risk[7] are thus supposed to be retained on balance sheet. In other words, loan quality should be lower for securitizing banks and negatively correlated to the degree of securitization.

Regulatory capital ratio

By regulation, the capital level is tied to asset level to maintain some minimum capital-to-asset as capital to risk-weighted asset ratio[8]. When banks approach or fall below the minimum capital level, they may resort to securitization.[9] Regulatory capital arbitrage may motivate banks with capital constraints to raise their regulatory capital ratios via securitization process. From the angle of capital saving, the regulatory capital constraint can be released through securitization. By repacking and selling off some on-balance-sheet assets, the bank could reduce the asset size and thus achieve the purpose of meeting capital requirements. Thus, higher probability and degree of securitization should be associated with lower capital ratios.[10]

Funding cost

Leland and Skarabot, Pennacchi and Obay show that securitization enables funding

[7] Default risk may not be best indicator for "bad quality asset" as implied by information asymmetry theory. Level of information asymmetry depends on how hard to predict the default risk of the assets. A more suitable measure should be volatility of default risk.

[8] Regulatory capital ratios I applied here include Tier I risk-weighted capital ratio and total risk-weighted capital ratio which will be introduced in next section.

[9] Banks are expected to meet a minimum total risk-based capital ratio of 8 percent by Basel Accord.

[10] Securitization may be achieved indirectly by a bank selling assets to a securitizer, however, my test would not review this action.

without higher cost from issuing equity or borrowing intermediate funds. Banks with higher funding cost on their balance sheet are more likely to resort to securitize to avoid deposit insurance and capital reserves.

What's more, the information asymmetry theory states that funding costs are lower for best assets under securitized funding mode compared to deposit funding mode. Thus funding cost of balance sheet assets should be higher for securitizing banks.

Size

Obay aruges that the larger the size of the bank, the higher the level of sophistication of the management team to be more capable carrying out complicated process of securitization. Also securitization usually requires high set-up cost that could be more likely to occur in large banks because of economic scales.

Profitability and Efficiency ratio

Securitization allows a bank to create assets, make income thereon, and yet put the assets off the balance sheet the moment they are transferred to the SPV. Thus, the income from the asset is accelerated and the assets disappear from the balance, as implied by capital saving and regulatory capital arbitrage arguments. Thus securitization should lead to an improvement in profitability in the sense of income-related and asset-related ratios.

From another angle, securitization requires sophisticated management with stable and healthy performance of the originating bank. A commonly used efficiency measurement is defined as non-interest expense to gross revenue. Thus a lower efficiency ratio indicates better performance of the bank. Banks with "a better mode" of operation would be more likely to carry out securitization activities. Thus securitization is expected to be negatively related with efficiency ratio.

Portfolio composition

The information asymmetry theory implies that the best assets in terms of low degree of information asymmetry are preferred to be securitized. Portfolio composition shows weights of different types of loans and thus reveals the ease to which a portfolio can be assessed by an outsider and the degree to which it exhibits stable statistical properties. The higher weights of the securitizable loans are the larger potential to securitize.

B. Design of the Tests

To answer the first question that "how do securitizing and non-securitizing banks differ", I will carry out the multivariate analysis of variance (MANOVA) test for overall level of all characters and Wilcoxon test on single character basis.

The MANOVA test is a parametric test and an extension of univariate analysis of variance (ANOVA). It is used to assess group differences across multiple metric variables simultaneously. In my research, it tests whether securitizing and non-securitizing are the same or different based on the vectors of means of all variables. One advantage of running MANOVA here is to control for overall error. As shown in previous part, I will compare between securitizing and non-securitizing banks upon eight characteristics. If we run a series of eight separate ANOVAs for each characteristic, the type I error i.e., probability of incorrectly rejecting a true null hypothesis would be between 5% and 34%[11].

There are a few assumptions to be met for the test to be valid: 1). Equality of variance-covariance matrices, 2). Independence of the observations.

As to the first assumption, Hair et al. (1992) states that "its violation has minimal impact if the groups are of approximately of equal size". Thus, the MANOVA test will be done on securitizing and non-securitizing groups of same size, which will be discussed in next section. For the second assumption, a time-ordered effect (serial correlation) is major cause of violation. As this thesis only applies cross-sectional instead of time-series

[11] Assume each of the eight tests could have a 5% probability of type I error. If all characteristics are perfectly correlated then the possibility of type I error is 5%. When all characteristics are uncorrelated then the type I error is calculated as 1-(.95^8), which is 34%.

data, the problem is thus eliminated some extent.

The null hypothesis is stated as follows: securitizing and non-securitizing groups are not different when compared on the basis of liquidity risk, loan quality, regulatory capital ratio, funding cost, efficiency ratio, profitability, portfolio composition and size.

There are four tests provided by SAS to test the overall differences among groups which are Wilks' Lambda, Pillai's Trace, Hotelling-Lawley Trace and Roy's Greatest Root. Wilks' lambda is the most preferred one and thus will be used in my study. It measures the ratio of the within-groups sum of squares to the total sum of squares. Its values range from 0 to 1.0. Strong values indicate strong group differences and vise versa.

The second test for question 1 is the Wilcoxon rank sum test for differences in the medians. Why do I choose Wilcoxon test instead of the t-test? Because distributions on the variables of the two groups of securitizing and non-securitizing banks fail to follow normal distribution with equal variance. This violates the assumption of the t-test. The Wilcoxon rank sum test tests on the medians instead of means. It is a widely used and powerful nonparametric procedure for testing differences between the medians of two populations, and it does not depend on the assumption of normality for the populations.

The null hypothesis of a two-tail test states as the difference between medians of the two samples is zero. In the Wilcoxon test, if each sample size is larger than 10, large-sample approximation formula will be used for testing the null hypothesis; thus, Z statistics will be presented. Size factor will be excluded in the test as the samples are matched groups with similar asset size.

For question 2 "how does each factor jointly correlate with the decision to securitize", I will use a logistic regression to test the relation between the characteristics with securitization decision. The logistic model is a binary regression model. In the model, the dependent variable is either "0" or "1", rather than any figure of securitization volume. "0" is assigned to non-securitizing banks and "1" is assigned to securitizing banks when the securitization volume is greater than zero. With this model we can test the effects of independent variables upon the dependent variable which is in binomial form. In other words, we test on the characteristic impact on "Yes" or "No" decision. A logistic equation is as follows:

$$\ln[p/(1-p)] = \boldsymbol{a} + \beta X + e \text{ or}$$

$$[p/(1-p)] = \exp(\boldsymbol{a} + \beta X + e)$$

where:

- ln is the natural logarithm, $\log_{exp}$, where exp=2.71828…
- p is the probability that the event Y occurs, p(Y=1), here means probability of securitization
- p/(1-p) is defined as "odds ratio"
- ln[p/(1-p)] is the log odds ratio, or "logistic"
- X is the vector of independent variables, here means the eight characteristics
- β is the vector of coefficients
- ***a*** is the constant term
- e is the error term.

The estimated probability is:

$$p = 1/[1 + \exp(-\boldsymbol{a} - \beta X)]$$

With the above functional form:

- if you let $\boldsymbol{a} + \boldsymbol{B}X = 0$, then p = .50
- as $-\boldsymbol{a} - \boldsymbol{B}X$ gets really big, p approaches 1
- as $-\boldsymbol{a} - \boldsymbol{B}X$ gets really small, p approaches 0.

A matching game is required again for the logistic regression test. Both tests base on the two observation groups of securitizing and non-securitizing banks. The Wilcoxon test examines on the differences of characteristics between the two groups while logistic test

looks for relation between the characteristics and the decision to securitize (securitizing banks) or not (non-securitizing banks). Apparently, size plays a major role in affecting the decision. The problem with size is that if the securitizing banks were all large, there may be factors correlated with size so we would be loosing at the differentiating between large and small banks, not securitizing and non-securitizing banks. Thus I would exclude this factor while testing on other characteristics. I match securitizing banks with non-securitizing banks of similar asset size so as to eliminate possible biases. A measure called "Percentage Correction Prediction" was applied in SPSS test for the test power of logit regression. The "Percent Correct Predictions" statistic assumes that if the estimated p is greater than or equal to .5 then the event is expected to occur and not occur otherwise. By assigning these probabilities 0s and 1s the "Percent Correct Predictions" is calculated. The bigger this measure is, the better the model describes the decision.[12]

Question 3 asks what factors determine the amount of securitization a bank does given that it is a securitizing bank. To answer this question, linear regression will be carried out. A bank is not only faced with the decision of whether or not to securitize assets, but also must decide how much to securitize. The objective is to assess the relative contribution of each of the independent variables in explaining levels of asset

[12] My tests do not actually model the decision usually associated with a logistic model because of simultaneity of the dependent variable. Dependent variable could be instead, from data of previous period than that of independent variable.

securitization by banks. I will examine relation between every characteristic and securitization level individually as well in combination with all other characteristics. The volume of securitized assets to total assets is defined as the dependent variable in the linear regression model in this test.

In my data, a major problem emerges in both multiple logistic and linear regressions, which is multicollinearity among independent variables. With multicollinearity it may be the case that even small changes in the data can produce wide swings in the parameter estimates. What's more, coefficients may have very high standard errors and low significance levels in spite of the fact that are jointly highly significant. Besides, coefficients may take the wrong sign and implausible magnitudes. In order to solve this problem, I will run a correlation test among all independent variables and do adjustments before the logistic and linear regression tests. I will drop some of the variables which describe the same characteristic and cause the high correlations. I will also separate those variables that have significant correlations into different test combinations.

IV. Data and Findings

A. Data Source

The data set I use is the Bank Holding Company Performance Report (BHCPR) from the database of Federal Reserve Bank of Chicago. I use the data mainly from the Consolidated Financial Statements (FR Y-9C) for the last quarter of year 2004. A Bank Holding Company (BHC) by definition is a company that owns two or more banks, registered with governors of the US Federal Reserve System. The Bank Holding Company Performance Report (BHCPR) is an analytical tool produced by the Federal Reserve System for supervisory purposes. It is designed to assist analysts and examiners in determining a BHC's financial condition and performance based on financial statements, comparative ratios, trend analyses, and percentile ranks relative to its peers.

Obay uses data from the same source but he chooses to use commercial bank data. I believe it is better to use data from the BHC since the securitization decision is made at the headquarters level instead of subsidiary level. Because banks are subject to legal lending limits, the largest loans are likely to be booked in the largest bank even when issued elsewhere within the BHC and the figure is shown on BHC's balance sheet. In my study, each BHC is treated as one single banking organization representing the

securitization activities and characteristics at integrated level.[13]

B. Selection of Sample BHCs

By quarter 4 year 2004, there are 2605 observations of BHCs. Among the whole pool, 2267 banks have their assets observable, and 416 out of them have assets size larger than US$ 1 billion. Before taking a look at the description on the data, some BHC observations are dropped for three reasons:

First, redundancy exists in counting parent company and the subsidiaries where both are registered as BHCs. For example, HSBC North America Holdings Inc. is the parent of HSBC Investments (North America) INC. and HSBC North America Inc., however, the BHC database counts all of three.

Second, some bank holding companies' main business lines do not lie in banking, but in other financial services, such as insurance or consulting. For example, Deutsche Bank Trust Corporation is the asset management subsidiary of Taunus (a US subsidiary of Deutsche Bank).

[13] Capital adequacy requirements are enforced at both the BHC and individual bank level.

Third, some BHC performance reports provide incomplete data for the variables that I examine. This may also be linked to the second reason that some BHC are mainly doing other business and do not provide data related to banking operations.

The following are tables of examples illustrating how I dropped redundant or ineligible observations.

Table 2: BHCs Kept or Dropped within HSBC Group

Name of the BHC	Business Nature	Status in the Sample
HSBC North America Inc.	Bank Holding Company of HSBC in North America with major business in banking	Keep
HSBC North America Holdings Inc.	Bank Holding Company of HSBC in North America including major business other than banking	Drop
HSBC Investments (North America) Inc.	Formally as Household International Inc. and acquired by HSBC Holding plc as a wholly owned subsidiary	Drop
HSBC Finance Corporation	Credit card issuers and consumer lenders	Drop
HSBC Securities (USA) Inc.	Investment bank	Drop

Table 3: BHCs Kept or Dropped within CitiGroup

Name of the BHC	Business Nature	Status in the Sample
Citicorp Inc.	Bank Holding Company with major business in banking	Keep
Citigroup Inc	Bank Holding Company including other major business such as insurance	Drop
Citigroup Holding Company	Bank Holding Company including major business other than banking and without regulatory capital ratios on balance sheet	Drop

Table 4: BHCs Kept or Dropped within Deutsche Bank Group

Name of the BHC	Business Nature	Status in the Sample
Taunus Corporation	US Banking Holding Company of Deutsche Bank	Keep
Deutsche Bank Trust Corporation	Asset management subsidiary of Deutsche Bank in US	Drop

I drop those BHCs with inadequate data required for my test reported in the BHCPR. I also drop those not operating mainly in banking field by referring to BHCs' websites. If the parent company has most of its activities in banking, then I keep the parent and I drop its subsidiaries. But when the parent also includes other essential parts such as insurance, I keep the banking subsidiary while dropping other subsidiaries as well as the parent. Citigroup Inc., originally the largest bank in terms of asset size, has been dropped because it is a BHC that includes Travelers Insurance whose main activity are outside of banking. After dropping Citigroup Inc, J.P. Morgan Chase & Co. then becomes largest bank of asset size.

This left me with 367 BHCs in the whole target group (asset size larger than US$ 1billion). Within that group 56 banks did securitization. However, three observations out of 56 securitizing banks are excluded as extreme values[14]. The clean data group of 53 securitizing banks is set as test sample for MANOVA test and linear regression. List of the 53 securitizing and the matching group of 53 non-securitizing banks are shown in appendix table 2 and 3.

C. BHC Size and Description on Securitization

1). Description of BHC Size

Among the banks with asset size over US$1 billion, number of securitizing versus banks versus non-securitizing banks is about 1: 6 (53 versus 314). Nevertheless, total assets of the 53 securitizing banks add up to US$ 6356 billion, which is 3.68 times of that for all non-securitizing banks left in the group (US$ 1728 billion). The average asset size for the 53 securitizing group is US$ 120 billion and that for non-securitizing group is US$ 5 billion. In other words, securitizing banks are on average over 20 times larger in

[14] For these three banks, securitization volumes as percentage to total assets were trivial (i.e., less than .1%) and may distort the test result. The banks and percentage to securitize were shown in the table below the list of 53 securitizing banks in appendix.

term of size than the non-securitizing bank. Also, among the 53 securitizing banks, 43% are from top 50 banks and 75% are from top 100 banks. Thus, we can conclude that securitization concentrates in large banks.

Table 5: Top 10 Banks Ranked by Assets Size and Their ABS Outstanding

	Name of the Bank	Assets (bnUS$)	Percentage to all banks with size >= 1US$bn (%)	Securitization Volume (bnUS$)	Percentage to assets (%)
1	J.P. Morgan Chase & Co	1,138.47	14.08	95.84	8.42
2	Bank of America Corporation	1,089.31	13.47	86.75	7.96
3	CitiCorp	899.60	11.13	339.61	37.75
4	Wachovia Corporation	436.70	5.40	61.14	14.00
5	Wells Fargo & Company	421.55	5.21	202.48	48.03
6	Taunus Corporation	321.38	3.98	27.03	8.41
7	U.S. Bancorp	192.84	3.12	0.40	0.21
8	HSBC North America Inc.	155.26	3.01	4.74	3.05
9	National City Corporation	136.37	2.88	3.38	2.48
10	Citizens Financial Group, Inc.*	134.44	2.50	0	0

*The largest bank not securitizing is Citizens Financial Group, Inc. with asset of US$134,436,100. It didn't carry out any securitization activity in the previous three quarters, either. It's the US banking arm of Royal Bank of Scotland.

As suggested by the literature, size of the bank plays a major role in securitization activity. Large banks are more likely to securitize with higher securitization degree. I will

examine other characteristics besides size factor in this thesis. Even if I picked up the largest 53 non-securitizing banks to match with 53 securitizing banks, the latter group is much smaller in average assets size. Quite possibly the difference in the variables shown by the test would be due to the size effect instead of securitization activities. That's the reason why I match the smallest 20 securitizing banks with 40-nonsecuritizing banks with similar assets size. First, I pick the 20 smallest banks from the bottom of the securitizing group. They are then matched on a one-by-one base with 40 non-securitizing banks with closest asset size. It means for each of the 20 securitizing banks, I choose its next smaller and next larger non-securitizing banks. Thus there are two non-securitizing banks matched with each securitizing banks with closest assets size. Why do I choose only 20 securitizing banks from the whole 53 securitizing banks? Though the 20 securitizing banks form a small sample, adding more securitizing banks would again break the balance and make size of the securitizing group overwhelming. Also, the Wilcoxon test only requires the sample size for each comparing group to be no less than 10 to apply the Z test, whereas sample size is 60 under Logistic test. Therefore, the matching groups are set as target sample for the Wilcoxon and logistic test.[15]

[15] As both tests do not require the matching groups to hold same number of observations, 20 securitizing banks were thus matched with 40 non-securitizing with similar asset size. List of the banks chosen as sample would be shown in appendix.

Table 6: Banks in the Study: 20 Size-matched Securitizing banks

Name	Assets ($mn)	Securitization ($mn)	% of Assets
FIRST BANCORP	15,177.66	2.56	0.02
DORAL FINANCIAL CORPORATION	14,983.40	10,715.61	71.52
MERCANTILE BANKSHARES CORPORATION	14,303.02	125.95	0.88
SOUTH FINANCIAL GROUP, THE	13,649.52	20.68	0.15
FIRST NATIONAL OF NEBRASKA, INC.	12,074.86	2,577.33	21.34
INTERNATIONAL BANCSHARES CORPORATION	9,440.64	30.97	0.33
R&G FINANCIAL CORPORATION	9,188.85	3,932.31	42.79
FRANKLIN RESOURCES, INC.	8,220.02	791.24	9.63
FIRST BANKS, INC.	7,566.41	23.15	0.31
SUSQUEHANNA BANCSHARES, INC.	7,449.86	516.22	6.93
UNITED BANKSHARES, INC.	6,289.65	28.20	0.45
EAST WEST BANCORP, INC.	5,567.84	65.51	1.18
IRWIN FINANCIAL CORPORATION	5,388.75	591.75	10.98
MB FINANCIAL, INC	5,069.41	8.50	0.17
AMCORE FINANCIAL, INC.	4,878.73	135.27	2.77
MAINSOURCE FINANCIAL GROUP	1,556.71	500.59	32.16
FARMERS & MERCHANTS INVESTMENT, INC.	1,404.49	274.16	19.52
AMERICAN NATIONAL CORPORATION	1,370.23	63.78	4.65
LAURITZEN CORPORATION	1,166.10	462.04	39.62
UNITED NATIONAL CORPORATION	1,043.42	47.71	4.57

Table 7: Banks in the Study: 40 Size-matched Non-securitizing Banks

Name	Assets ($mn)
WEBSTER FINANCIAL CORPORATION	17,810.52
SKY FINANCIAL GROUP, INC.	14,665.16
BOK FINANCIAL CORPORATION	14,435.56
COMMERCE BANCSHARES, INC.	14,153.30
CITY NATIONAL CORPORATION	13,982.61
CBI-KANSAS, INC.	13,829.53
FIRST CITIZENS BANCSHARES, INC.	13,019.10
FBOP CORPORATION	12,912.59
TCF FINANCIAL CORPORATION	12,114.08
INVESTORS FINANCIAL SERVICES CORP.	10,793.39
VALLEY NATIONAL BANCORP	10,630.85
WILMINGTON TRUST CORPORATION	9,667.50
ESB ACQUISITION CORP.	9,634.62
BANK OF HAWAII CORPORATION	9,602.51
OLD NATIONAL BANCORP	8,982.40
HUDSON UNITED BANCORP	8,833.76
DISCOUNT BANCORP, INC.	8,600.03
TRUSTMARK CORPORATION	8,150.63
CITIZENS BANKING CORPORATION	7,658.68
FIRSTBANK HOLDING COMPANY	7,274.52
PROVIDENT BANKSHARES CORPORATION	6,397.84
NEWALLIANCE BANCSHARES, INC.	6,283.30
BANK LEUMI LE-ISRAEL CORPORATION	5,588.38
FIRST NATIONAL BANKSHARES OF FLORIDA, INC.	5,503.52

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Name	Assets ($mn)
COMMUNITY FIRST BANKSHARES, INC.	5,477.72
INVESTORS BANCORP, MHC	5,324.48
ALABAMA NATIONAL BANCORPORATION	5,125.76
EASTERN BANK CORPORATION	5,055.85
SILICON VALLEY BANCSHARES	4,894.16

2). Types of Securitization

There are seven different securitization types according to asset class that are documented by BHCPR. Three banks are involved in all seven asset type-securitization activities: J P Morgan & Chase, Bank of America Inc. and CitiCorp, which are exactly the top three BHC ranking by size in the group. Please look at Table 8 which shows number of banks and amount of securitization for each asset type-group securitization.

1-4 family residential loans group is most popular type of securitization with the largest weight of 66.32% to total securitization volume, and is practiced by 36 banks among the 53 banks. It is apparent that 1-4 family residential loans securitization is essential to the economy, because mortgage lending enables people to afford their house and securitization provides liquidity to the mortgage market.

Table 8: Number of Banks and Volume Outstanding for Each Asset Type-group Securitization

(Billion US$)

	1-4 Family Residential Loans	Credit Card Receivables	All Other Loans and Leases	Home Equity Lines	Commercial and Industrial Loans	Other Consumer Loans	Auto Loans	Total
Volume	822.50	239.37	87.49	31.63	27.34	16.81	15.11	1,240.25
Weight to the total volume %	66.32	19.30	7.05	2.55	2.20	1.36	1.22	100.00
No. of banks undertaking securitization activities	36	9	20	14	9	13	14	53
Average volume of securitization per BHC	22.85	26.60	4.37	2.26	3.04	1.29	1.08	NA

The credit card receivables group ranks second with 19.3% of the volume of bank securitization, which is concentrated in a few banks. Only 9 banks in the whole group did credit card receivables backed securitization and the average volume is comparably larger. The average volume outstanding for each BHC is US$ 26.6 billion. In contrast, the auto loans group has rather smaller weight as 1.22% but spread in 14 banks. The average deal size is less than 1/20 of the average deal size of credit card receivables group.

Credit card backed ABS has been issued in the public debt market since 1987. Now

it is the second largest and most liquid securitization market. The large size corresponds to the rapid growth in the credit card market overall as consumers have come to rely on credit cards as a convenient method of payment for an expanding universe of good and services as well as a means of accessing credit. US credit card securitization outstanding in the first quarter of year 2003 was US$401.6 billions, which takes up 25.2% of Total ABS amount[16]. This means that the bank sample above accounts for about half of credit card receivables securitization.

Also, the credit card industry is internally a highly concentrated industry – largest players have the economies of scale. Obviously, therefore, the credit card securitization market is also a highly concentrated market.

These above two reasons help us to understand the concentration and larger size phenomenon of credit card receivable group.

[16] Source from Bond Market Association

IV. Results

This section gives the results of the tests described in section II. Part A will be findings from Wilcoxon tests and MANOVA test on difference between securitizing and non-securitizing based on the variables representing bank characteristics. Then partial correlation results will be presented for the purpose of dropping variables with serious correlations. Part C and D show results of logistic regression and linear regression tests, and reveal the relation between securitizing decision/degree and the financial factors.

A. Difference Between Securitizing and Non-securitizing BHC Characteristics

As introduced in section II, I will examine seven characteristics: liquidity risk, portfolio quality, regulatory capital ratio, funding cost, profitability, efficiency ratio, and portfolio composition. I will use multiple variables to measure some characteristics as they will more accurately measure the characteristic from different aspects. For example, liquidity risk can be measured by composition of bank's deposits, such as weights of core deposits and volatile deposits. From another angle, ratio of reserves to deposits also shows the bank's liquidity need. Obay also uses multiple variables to describe each characteristic in his work.

1). Univariate Test between Securitizing and Non-securitizing banks Characteristics

As discussed in previous section, Wilcoxon sum rank test will be used to examine the medians of ratios that describe securitizing and non-securitizing banks on univariate level. The ratios are selected directly from or calculate from BHC Performance Report. Table A1 in the appendix gives the BHC Performance Report source of each of the variables to be tested. Using the Wilcoxon test, 20 securitizing banks matched by 40 non-securitizing banks that have been size-matched.

Liquidity

I select five measures of liquidity which I explain and analyze in the following part. The five measures are shown in Table 9.

Core Deposits to Total Deposits Ratio: Core deposits represent the stable part of deposits available to fund longer-term assets. They are retail accounts with principal amounts less than $100,000. Though individually not contractually long-term, the portfolio provides stable long term funding. The larger the portion of core deposits is, the less the needs for liquidity and securitization. The mean value of this ratio is smaller for the group of securitizing banks. Wilcoxon test also shows negative sign on the median difference at 1% significant level. A lower core deposits ratio indicates securitizing banks has higher liquidity risk compared to the non-securitizing group.

Table 9: Liquidity Risk

Ratios	Expected Value for Securitizing Banks (higher liquidity risk)	Mean on 20 Securitizing Banks %	Mean on 40 Non-securitizing Banks %	Wilcoxon Test Result for Securitizing Banks	Test Statistics (P-value)
Core Deposits/Total Deposits %	Lower	74.35	83.56	Lower	-3.39 (.0007)***
Volatile Deposits/Deposits %	Higher	48.65	30.83	Higher	1.97 (.0485)**
Reserves/Deposits %	Lower	43.17	53.64	Insignificant	-1.15 (.2492)
Net Federal Funds Purchased/Assets %	Higher	2.77	2.13	Higher	3.03 (.0024)***
Loans/Deposits %	Higher	101.53	80.38	Insignificant	0.19 (.8477)

Note:

Core Deposits are the sum of demand deposits, deposit accounts that are subject to negotiable orders of withdrawal or automatic transfer from the savings accounts, time deposits (excluding brokered deposits) with balances under $100,000, money market deposit accounts, other savings accounts, and other non-interest-bearing deposit balances;

Volatile Deposits are brokered deposits less than $100,000 with a remaining maturity of one year or less, foreign offices time deposits with a remaining maturity of one year or less, time deposits of less than $100,000 with a remaining maturity of one year or less, and federal funds and repos purchased;

Reserves are cash and balances due from depository institutions, Securities, and Federal funds sold and securities purchased under agreements to resell;

Net Federal Funds Purchased are federal funds sold in domestic offices / Federal funds purchased in domestic offices.

Volatile Deposit to Total Deposit Ratio: As opposed to core deposits, volatile deposits, made up of brokered deposits and time deposits less than $100,000 with maturity equal or less one year, federal funds purchased, are more likely to be withdrawn upon maturity without warning and thus reflect higher liquidity risk. Also, they require higher interest expense compared to core deposits. Thus, a bigger portion of volatile deposits in total deposit may stimulate securitization from both the consideration of liquidity risk and funding cost. Both the mean value of the ratios and Wilcoxon test result is higher for securitizing group. It follows the intuition that securitizing banks face higher liquidity risk represented by larger portion of volatile deposit.

Reserve to Deposit Ratio: It is a measurement of degree to which highly liquid assets are available to pay out deposits. Banks can either make loans from deposits or keep them as reserves. If the bank chooses to make fewer loans and save more reserves, it has a higher Reserve to Deposit Ratio. Thus the bank has less liquidity need, and then there is less motivation to securitize. In other words, the higher the ratio, the lower needs of securitization. The mean value of this ratio is lower for securitizing banks, while the Wilcoxon test shows a negative sign but without significance. The lower ratio indicates higher liquidity risk for the securitizing banks which follows my hypothesis that higher liquidity risk motivates securitization.

Net Federal Funds Purchased to Assets Ratio: This liquidity measure is the difference between federal funds purchased and sold as a percentage to assets. The Federal funds (Fed funds) market is the market for overnight and short-term unsecured lending of excess reserve funds between banks. Such lending is referred to as "Fed funds sold" by the lending bank and "Fed funds purchased" by the borrowing bank. If a bank has excess reserves, it can sell the reserves and record the sale as an asset. If a bank needs funds to meet either its reserve requirements or other obligations, it can purchase the excess reserves of another bank. Thus, a higher ratio reflects higher liquidity risk, and a negative ratio indicates excess liquidity. The mean value of this ratio is higher for securitizing banks, and Wilcoxon test reveals larger median at 1% significant level compared to non-securitizing banks. The results show that securitizing banks have higher liquidity risk as having heavier portion of borrowing from other banks.

Loan to Deposit Ratio: This is similar to the Reserves to Deposits Ratio. Loans make up a large portion of the bank's assets and its principal obligations are the deposits that can be withdrawn on request. Thus this is a type of debt coverage ratio, and it measures position of the bank with regard to liquidity risk. Higher loan to deposits indicates more risk from a debt standpoint. In other words, the higher the ratio the less liquidity the bank has. It is also a measure of the degree to which the BHC is a traditional bank. The mean value of this ratio is higher for securitizing banks indicating a higher liquidity risk they

face. The Wilcoxon test also shows a positive sign but fails to be significant.

All liquidity indicators show securitizing banks present higher liquidity needs. This agrees with the hypothesis that higher liquidity risk promotes securitization as an alternative funding mechanism. Obay (2000) also finds that liquidity risk is higher for securitizing bank measured by the ratio of Deposits / Assets.

Portfolio Quality

The second characteristic to be examined is portfolio quality.

Table 10: Portfolio Quality

Ratios	Expected Value for Securitizing Banks (poorer quality)	Mean on 20 Securitizing Banks %	Mean on 40 Non-securitizing Banks %	Wilcoxon Test Result for Securitizing Banks	Test Statistics (P-value)
Charge-offs /Loans %	Higher	.90	.22	Higher	1.14 (.0485)**
Allowances/Loans %	Higher	.98	.17	Insignificant	1.97 (.2510)
Provision/Loans %	Higher	2.32	1.42	Insignificant	1.06 (.2492)

Charge-offs to Loans: It is loan losses net of any recoveries as a percentage of loans. Charge-offs are loans which have been written off the books and charged against the allowance for loan losses. This ratio measures the overall rate of credit losses incurred

and thus indicates the portfolio quality. Obay discusses that the better the quality of repackaged assets, the lesser the enhancement that is needed to realize an improved return and the better the acceptance of the ABS issue among investors. Besides, there is the general belief that the market will only permit the sale of high quality repackaged assets implied by information asymmetry theory. Therefore, higher charge-off ratio representing lower quality of the remaining assets on balance sheet is likely to be associated with securitization. The mean value of the ratio is higher for securitizing banks which follows the above intuition. Wilcoxon test also shows significantly positive sign on the median difference.

There are two other similar measurements from balance sheet and income statement respectively:

Allowances to Loans: The allowance for loan losses is an accounting estimate of credit losses inherent in a loan portfolio. This credit balance account reflects the amount set aside to provide a cushion to absorb losses on outstanding loans. Both the mean value and Wilcoxon test result (insignificant) show higher allowances to loans ratio for securitizing banks. The amount carried in this account shall represent possible losses which may be incurred in the normal payoff of outstanding loans, and shall be considered as a deduction from total loans shown on the financial statement in order that the asset

reflects fair market value. Thus average ratio of higher allowances to loans for securitizing bank follows the intuition that banks securitize their best assets and remain poorer quality loans on balance sheet.

Provision to Loans: Provision for loan loss expense (debit) creates a reserve for loan losses (credit or contra-asset against loans). When a loan is charged off, the loan is removed (credit) and the reserve is reduced (debit). The provision for loan losses is an expense item that adds to a bank's loan loss reserve (a contra-asset account). Banks increase their provision for loan losses in anticipation of credit quality problems in their loan portfolio. A higher average provision to loan ratio here for securitizing banks shows their poorer loan quality and thus agrees with the expectation, but the difference, while large, is statistically insignificant.

As discussed in previous section, banks tend to securitize their better quality assets while retaining worse quality assets on balance sheet. Obay (2000) discusses that bank regulators force banks to write off bad loans while appreciating loans must be carried at book value. This generates an understatement of bank equity that is available for loan losses. The bank sells appreciating low-risk and high-value loans in order to realize capital gains that would balance the understatement brought to the book value of equity capital. Thus a higher level of loan charge-offs, allowances and provision indicating the

lower quality of the remaining assets in the bank is likely to promote securitization activity.

Funding Cost

The next characteristic to be tested is funding cost.

Table 11: Funding Cost

Ratios	Expected Value for Securitizing Banks (higher funding cost)	Mean on 20 Securitizing Banks %	Mean on 40 Non-securitizing Banks %	Wilcoxon Test Result for Securitizing Banks	Test Statistics (P-value)
Deposit Interest Expense/Total Deposits %	Higher	1.06	.81	Higher	2.29 (.0220)**

Deposit Interest Expense / Total Deposits: A higher ratio means the bank pays a comparatively higher cost to attract deposits. Imagine some bank experiencing shortages of funds and forced to reply on volatile deposits, such as brokered deposits. It is likely to require higher interest on the borrowed funds[17] and thus exhibit a higher funding cost in terms of Deposit Interest Expense over Total Deposits. In this case, banks may find it more efficient to securitize assets rather than pay high funding costs on the volatile deposits. The Wilcoxon test reveals positive sign for the difference at 5% significance

[17] Banks pay higher interest to attract volatile deposit because subsidy is attached to core deposits through FDIC insurance.

level which means this ratio is higher for securitizing group. The mean of the ratio is also higher for securitizing banks. These results indicate higher funding cost for securitizing banks as one motivation for securitization.

Capital Ratio

The next characteristic to be examined is regulatory capital adequacy ratio. Bank regulators require banks to maintain at least a minimum ratio of equity capital to its credit risk-weighted exposure. The Basel Committee on Banking has set this ratio to permit banks to absorb losses without becoming insolvent, in order to protect depositors. As discussed in previous sections, banks facing capital constraints or approaching the minimum capital adequacy may securitize their best assets to release the capital constraints and bring up their capital adequacy ratios. This characteristic will be measured by two ratios from the BHC Performance Report as shown in the following table.

Table 12: Capital Adequacy Ratio

Ratios	Expected Value for Securitizing Banks (lower regulatory capital ratio)	Mean on 20 Securitizing Banks %	Mean on 40 Non-securitizing Banks %	Wilcoxon Test Result for Securitizing Banks	Test Statistics (P-value)
Tier I Risk-Based Capital %	Lower	17.14	12.44	Lower [18]	-2.10 (.0359)**
Total Risk-Based Capital %	Lower	18.70	14.28	Lower	-1.68 (.0921)*

The two capital adequacy ratios in the table are used to measure the adequacy of the bank's risk weighted capital, where Tier I and Total Risk-based Capital are the numerators and Risk-Weighted Assets is the denominator.

Risk-Weighted Assets are assets classified in categories with specific risk weights. The risk weight assigned to a particular asset determines the percentage of that asset which is added with all other risk-weighted assets to determine the bank's total Risk-Weighted Assets.

Tier I capital is core equity capital available to meet regulatory capital requirements

[18] The mean applied here, also known as arithmetic mean, is the average of the variables in the sample whereas median is the value of the number in the middle of the set of ordered variables. The wilcoxon test applies median instead of means as explained in part III. The median of Tier I Risk-Based Capital for 20 securitizing banks is lower (10.65) than that for 40 non-securitizing banks (13.12); the median of Total Risked-Based Capital for 20 securitizing banks is lower (13.28) than that for 40 non-securitizing (15.96). These numbers agree with the results of wilcoxon test.

being the sum of common shareholders' equity, common shares, contributed surplus, retained earnings, non-cumulative preferred shares plus minority interests in subsidiaries from Tier 1 capital minus goodwill. According to the Basel Accord (both the Basel I and Basel II), the Teri I capital adequacy ratio must exceed 4 percent.

Total Risk-based Capital is the sum of Tier I, Tier II, and Tier III capital[19], where applicable, less deductions for total risk-based capital (The amount of any intentional reciprocal cross-holdings of BHC's capital instruments, and any other deductions for total risk-based capital as determined by the Federal Reserve). According to the Basel Accord the Total Risk-based Capital Ratio must exceed 8 percent.

As suggested in previous discussion, banks are more likely to securitize facing capital constraint. Thus, securitizing bank is expected to reveal a lower capital adequacy ratio. Though the mean values of the two ratios are higher for non-securitizing banks, Wilcoxon test results support my hypothesis with negative signs at 5% and 10% significance level, respectively. The reverse signs are probably due to dispersion from normal distribution of the sample. As the distributions of the two ratios present positive

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19 Tier II and Tier III Capitals are the supplementary constituents of total regulatory capital. Tier II capital includes cumulative preferred shares; subordinate debt; property revaluation reserves; and general allowances for loan losses. Tier III capital consists mainly of certain short-term subordinated liabilities.

skewness, it makes more sense to compare the medians instead of the means. The two negative signs on the medians show that total risk-based capital ratio and tier I risk-based capital ratio are lower for securitizing banks. As stated in the hypothesis, banks with lower capital adequacy ratio (higher capital constraints) may be more probably refer to securitization. Thus this result agrees with the hypothesis. Obay also shows lower risk-based capital ratio for securitizing banks in his test on commercial banks.

Profitability and Efficiency

Profitability and efficiency characteristics are measured by following ratios:

Table 13: Profitability and Efficiency

Ratios	Expected Value for Securitizing Banks (higher profit and efficiency)	Mean on 20 Securitizing Banks %	Mean on 40 Non-securitizing Banks %	Wilcoxon Test Result for Securitizing Banks	Test Statistics (P-value)
Return on Assets %	Higher	1.82	.82	Higher	1.75 (.0798)*
Return on Equity %	Higher	11.79	11.57	Insignificant	.0627 (.9430)
Efficiency Ratio %	Lower	53.80	64.34	Lower	-2.04 (.0415)**

Return on Assets (ROA): Defined as net income over total assets in the BHC

Performance Report, it is a measurement of bank's profitability and performance. Academic research so far has not presented any theory on effect of securitization upon overall banks' profitability. An easy way to test the profitability difference between securitizing and non-securitizing banks is to measure the relationship between securitizing volume and profit. ROA is higher for securitizing banks in Wilcoxon test at 10% significance level. It supports the hypothesis that profitability is higher for securitizing banks. As an important measure (Hempel et al. 1990 p58) of bank performance, ROA could be substantially augmented by removing the securitized assets from their books and generating profits with the proceeds. Obay (2000) also gets the same result from his test.

Return on Equity (ROE) is a more moderate measure of a bank's profitability while ROA may change dramatically due to change in assets. Though Wilcoxon test loses significance, the mean value of this ratio is higher for securitizing banks as expected.

Efficiency ratio: It is defined as non-interest expense over gross revenue (summation of interest income and non-interest income). As margins shrink and the financial industry becomes more competitive, many banks seek to become more efficient and maintain profitability. This ratio gives us the cost of each dollar of revenue earned. As a general rule, the lower a financial institution's efficiency ratio, the better the performance. If one

associates securitization with efficiency, banks with "better mode" of operation would be more likely to carry out securitization activities. Wilcoxon test as well as the mean value show that efficiency ratio is lower for securitizing banks. As discussed before, securitization requires large set-up cost and sophistication of the securitizing bank. Thus banks with "better modes" of operation represented by a lower efficiency ratio would be more likely to securitize.

Finally, portfolio composition is measured with following ratios:

Table 14: Portfolio Composition

Ratios	Expected Value for Securitizing Banks	Mean on 20 Securitizing Banks %	Mean on 40 Non-securitizing Banks %	Wilcoxon Test Result for Securitizing Banks	Test Statistics (P-value)
Real Estate Loans/Loans %	Higher	63.17	66.41	Insignificant	.74 (.4110)
Consumer & Industrial Loans/Loans %	Higher	15.07	17.97	Insignificant	.45 (.6493)
Retail loans/loans %	Higher	14.43	9.64	Insignificant	.77 (.4423)

Portfolio composition is measured by the weights of three major types of loans as percentage to total loans shown in the table. The ratios are supposed to be higher for securitizing banks as they indicate higher securitizable loan ratio. Information asymmetry theory implies that best assets in terms of low degree of information asymmetry are

preferred to be securitized. The above three ratios show the weights of each type of loans and thus reveals the ease to which a portfolio can be assessed by an outsider and the degree to which it exhibits stable statistical properties. The higher weights of those securitizable loans are the larger potential to securitize. However, none of the three measures for portfolio composition turns to be significantly higher for securitizing banks.

In the above tests, the size factor was excluded, and I used seventeen variables representing liquidity, loan quality, capital adequacy ratio, funding cost, profitability and efficiency, and portfolio composition. Among all variables, nine ratios were significantly different for their medians and all with same direction as expected. As described in the hypothesis, the results indicate that securitizing and non-securitizing banks do differ based on all characteristics except portfolio composition. Securitizing banks have higher liquidity risk, poorer loan quality, lower capital adequacy ratio, higher funding cost, as well as higher profitability and efficiency, which all agree with my hypotheses.

2). Joint Test of Difference between Mean Values of the Characteristics

In this part, the MANOVA test are carried out on the 53 securitizing matched by 53 non-securitizing banks, because the test requires the same sample size for each group (see section III). Lists of the sample groups are shown in appendix Table A2 and A3.

The test statistic of Wilks' lamda significantly rejects the null hypothesis that the two groups are not statistically different based on all variables. This finding is in accordance with what Obay (2000) found. The statistic value is .715, and the F value is 2.37 with p value of .005. Over 70% of the variance is not explained by group differences. This result indicates that the overall financial characteristics of the two groups are significantly different at the 1% level.

B. Correlations Among Variables

The above tests look at individual characteristics of securitizing versus non-securitizing banks. In the remaining two tests, I will investigate the joint effects of BHC characteristics on securitization using. As described in section III above multicollinearity in variables may present severe problems when analyzing joint effects of characteristics. To address this problem, I carry out correlation analysis among all characteristic variables.

I drop variables that are highly correlated and describing same characteristics. Correlation also exists among variables indicating different characteristics. Thus, one single set of variables could lose some essential factor in describing one particular

characteristic. I then develop several groups of variables to better cover all characteristics.

Partial correlation test is carried out on the 20 securitizing matched with 40 non-securitizing banks. Thus suitable variables could be picked up for tests in next stage. I consider correlation coefficient of over 80% to be problematic. The whole correlation matrix for all variables is shown in Table 15.

1). Correlation within Same Characteristics Class

Liquidity risk:

No significant correlation found except for core deposit/deposit with volatile deposit/deposit which is -.81 at 5% significance level. A negative correlation states that the more the core deposit weights, the less volatile deposit weights and less liquidity constraint the banks face. Thus, these two ratios cannot be put together in the joint test.

Table 15 Correlation Matrix of All Variables

	Core_De	Vola_De	Loan_De	NetFedPur_Ass	Res_De	Char_Lo	Prov_Lo	Allow_Lo	Tier I	Cap	ROA	ROE	Eff.	Funding Cost	R E Lo	C& I Lo	Retail Lo
Core_De	1	-.81**	-.10	.24	-.14	-.09	-.13	-.13	.01	.03	-.07	-.14	.53*	-.30*	-.02	-.18	.14
Vola_De	-.81**	1	-.06	.02	.33*	.00	.03	-.01	.04	.01	.02	.15	-.53*	.22	-.03	-.03	-.06
Loan_De	-.10	-.06	1	-.21	-.25	.47**	.49**	.47**	.08	.01	.43**	.35**	-.23	.19	.18	-.25	.30*
NetFedPur_Ass	.24	.02	-.21	1	.02	-.07	.-.06	-.09	.07	.04	-.07	-.12	-.07	-.21	-.05	-.19	.09
Res_De	-.14	.33*	-.25	.02	1	.08	.03	-.01	.77***	.75***	.43***	-.01	-.06	.22	-.25	-.05	.09
Char_Lo	-.09	.00	.47**	-.07	.08	1	.99***	.98***	.53***	.55***	.89***	.46***	-.13	.37***	-.34***	-.06	.42***
Prov_Lo	-.13	.03	.49**	-.06	.03	.99***	1	.98***	.49***	.51***	.87***	.48***	-.17	.38**	-.29*	-.10	.40***
Allow_Lo	-.13	-.01	.47**	-.09	-.01	.98***	.99***	1	.46***	.48***	.85***	.46***	-.15	.36***	-.32*	-.10	.38**
Tier I	.01	.04	.08	.07	.77***	.53***	.49***	.46***	1	.99**	.78***	.28**	.01	.33*	-.30**	-.12	.36**
Total Cap Ratio	.03	.01	.01	.04	.75***	.55***	.51***	.48***	.99**	1	.79***	.28**	.03	.32**	-.32**	-.10	.37**
ROA	-.07	.02	.43**	-.07	.43**	.89***	.87***	.85***	.78***	.79***	1	.42**	-.24	.38***	-.35***	-.12	.65**
ROE	-.14	.15	.35**	-.12	-.01	.46***	.48***	.46***	.28**	.28**	.42**	1	-.12	.16	-.11	-.15	.27**
Efficiency	.53*	-.53*	-.23	-.06	-.06	-.17	-.15	.01	.03	.01	.03	-.12	1	-.22	-.11	.08	-.02
Funding Cost	-.30*	.22	.19	-.21	.22	.37**	..37**	.36**	.33**	.32**	.38**	.16	-.22	1	-.24	.06	.34**
R E Loans	-.02	-.03	.18	-.05	-.25	-.34**	-.29**	-.32**	-.30**	-.32**	-.35**	-.11	-.11	-..24	1	-.61***	-.57**
C & I Loans	-.18	-.03	-.25	-.19	-.05	-.06	-.10	-.01	-.12	-.10	-.12	-.15	.08	.06	-.61***	1	-.01
Retail Loans	.14	-.06	.30*	.09	.09	.72***	.70***	.68***	.36***	.37***	.65***	.27**	-.02	.34**	-.57***	-.01	1

Portfolio quality:

The three credit risk of portfolio measures highly correlate with each other. Thus, only one of the three ratios could be combined with other indicators in the regression each time.

Table 16 Correlation among Portfolio Quality Measures

	Charge-off/Loans	Provision/Loans	Allowance/Loans
Charge-off/Loans	1	0.99***	0.98***
Provision/Loans	0.99***	1	0.99***
Allowance/Loans	0.98***	0.99***	1

Capital adequacy ratios:

The two ratios are highly correlated with coefficient as 0.99 at 5% significance level. This means the two variables could not be shown in the regression equation simultaneously.

Profitability ratios:

Coefficient between ROE income and ROA is 0.42 at 5% significance level. Both of them could be input the test at the same time.

2). Correlation among Different Characteristics

One interesting finding is that the three portfolio quality measurements and capital adequacy ratios highly correlate with the profitability variables i.e. ROA with positive sign. ROE as a moderate profitability measure does not have such high correlation with other variables. Thus, I would use ROE in the regression tests and test the relations of those characteristics with securitization decision in separate combinations if ROA is applied.

Table 17: Correlation among ROA, Capital Adequacy and Portfolio Quality Ratios

	ROA	Charge-off/ Loan	Provision/ Loans	Allowance/ Loans	Tier I Risk-based Capital Ratio	Total Risk-based Capital Ratio
ROA	1	.89***	.87***	.85***	.78***	79***
Charge-off/Loan	.89***	1	.99***	.98***	.53***	.55***
Provision/Loans	.87***	.99***	1	.99***	.49***	.51***
Allowance/Loans	.85***	.98***	.99***	1	.46***	.48***
Tier I Risk-based Capital Ratio	.78***	.53***	.49***	.46***	1	.99***
Total Risk-based Capital Ratio	.79***	.55***	.51***	.48***	.99***	1

The Reserves to Deposits ratios is found to be highly correlated with capital adequacy ratio. It follows the intuition that banks with high reserves level provide adequate capital cushion represented by higher capital adequacy ratio. Therefore, I will use other liquidity measures to combine with the capital adequacy ratio in the

joint test.

Table 18: Correlations between Liquidity Risk and Capital Adequacy Ratios

	Reserves/Deposits	Tier I Risk-based Capital Ratio	Total Risk-based Capital Ratio
Reserves/Deposits	1	.77***	.75***
Tier I Risk-based Capital Ratio	.77***	1	.99***
Total Risk-based Capital Ratio	.75***	.99***	1

C. To Explain The "Decision" on Securitization

In this section, Logistic regression is carried out to test the joint effect of the characteristics on securitization "decision".[20]

According to the correlation results, I combine the variables without significant correlations to run the joint logistic test[21]. Variables with significantly high correlations are separately put into different combinations.

[20] The causation is problematic because the independent variables are contemporaneous with or even sequent to the actual decision the bank to securitize.

[21] All variables were tested in the logistic regression at univariate level before joint test which is shown in appendix table 5 and significant variables are core deposits/total deposits, volatile deposits/deposits, loans/deposits, charge-off/loans, provision/loans, deposit interest expense/total deposits, ROA, and efficiency ratio.

Table 19: Logistic Regression Results of Different Variables Combinations

Panel A (Excluding ROA)		Scenario I.	Scenario II.	Scenario III.	Scenario IV.
Characteristics	Constant	-.052	-.104	-.073	-.272
		(.99)	(.24)	(.42)	(.74)
Liquidity	Core deposits/total	-.117	NA	-.033	NA
	deposits	(.31)		(.22)	
	Volatile deposits/total	NA	.017	NA	.050
	deposits		(.28)		(.78)
	Loan/deposit	.057	.077	.080	.067
		(.01)***	(.01)***	(.01)***	(.01)***
Portfolio	Charge-off/loans	3.621	2.982	2.751	3.207
quality		(.44)	(.06)*	(.21)	(.37)
Funding cost	Deposit interest	1.202	1.043	.975	1.044
	expense/Total Deposits	(.02)**	(.44)	(.45)	(.43)
Profitability	ROE	.023	.069	.059	.085
		(.27)	(.39)	(.44)	(.29)
	ROA	-.140	-.082	NA	NA
		(.43)	(.31)		
Capital	Tier I capital ratio	NA	NA	-.074	-.067
adequacy ratio				(.29)	(.48)
	Total capital ratio	.069	.080	.010	052
		(.93)	(.93)	(.99)	(.39)
Efficiency	Non-interest	-.134	-.125	-.146	-.131
	expense/gross return	(.01)***	(.04)**	(.02)**	(.03)**.
	Real estate loans/total	.069	.080	.010	.052
	loans	(.93)	(.93)	(.99)	(.39)
Portfolio	Consumer & industrial	.054	.017	.011	.043
composition	loans/total loans	(.95)	(.86)	(.91)	(.52)
	Retail loans/total loans	.073	.030	.001	.031
		(.93)	(.49)	(.99)	(.70)
Test Power	Percentage Correction %	78.3	51.7	75.0	23.0

Table 19: Logistic Regression Results of Different Variables Combinations

Panel B (Including ROA)		Scenario V	Scenario VI
Characteristics	Constant	-.205	-1.013
		(.46)	(.72)
Liquidity	Core deposits/total	-.043	NA
	deposits	(.15)	
	Volatile deposits/total	NA	.007
	deposits		(.48)
	Loan/deposit	.057	.039
		(.01)***	(.03)**
Portfolio quality	Charge-off/loans	NA	NA
Funding cost	Deposit interest	1.547	.884
	expense/Total Deposits	(.17)	(.23)
Profitability	ROA	2.623	3.220
		(.02)**	(.01)***
	ROE	.360	.782
		(.46)	(.68)
Capital adequacy ratio	Tier I capital ratio	NA	NA
	Total capital ratio	NA	NA
Efficiency	Non-interest	-.122	-.213
	expense/gross return	(.01)***	(.03.)**
	Real estate loans/total	.037	.067
	loans	(.39)	(.77)
Portfolio composition	Consumer & industrial	.014	.042
	loans/total loans	(.81)	(.46)
	Retail loans/total loans	.058	.037
		(.41)	(.56)
Test Power	Percentage Correction %	56.7%	73.5%

As suggested by the correlation result, ROA highly correlates with charge-off/loans. Thus ROA was excluded when charge-off/loans was chosen in the test. Similarly, when ROA was included in the test, provision/loans would be excluded.

Provision/loans, allowance/loan, net federal funds purchased/assets and reserves/loans were not chosen as they turned to be insignificant in the logistic test at univariate level. In addition, reserves/loans were found to highly correlate with capital adequacy ratios.

The logistic regression model is simply a non-linear transformation of the linear regression. The "logistic" distribution is an S-shaped distribution function which is similar to the standard-normal distribution. The logistic distribution constrains the estimated probabilities to lie between 0 and 1.

The estimated coefficients must be interpreted with care. Instead of the slope coefficients (β) being the rate of change in Y (the dependent variables) as X changes (as in linear regression), now the slope coefficient is interpreted as the rate of change in the "log odds" as X changes. This explanation is not very intuitive. It is possible to compute the more intuitive "marginal effect" of an independent variable on the probability. The marginal effect is

$$dE(Y)/d\beta = f(\beta X)\beta = p(Y=1)\,(1-p(Y=1))\,\beta$$

For the group of 20 securitizing matched with 40 non-securitizing by asset size, logistic regression is carried out. "0" is assigned to non-securitizing banks and "1" is assigned to securitizing banks as the volume is greater than zero.

As discussed in section III, $p(Y=1)= \exp(\beta'X) / 1+ \exp(\beta'X)$, whereas β is vector the coefficients and x is vector of independent variables. Also, probability of

securitization "decision" changes as independent variables change. For example in combination I, we have Loans/Deposits (X1), Deposits Interest Expense/Total Deposits (X2) and efficiency ratio (X3) with significant coefficients. To calculate the marginal effect of those three factors, we should work out the probability to securitize i.e. p(Y=1) first. As different x values will influence the probability, I used mean value of each variable in the calculation. By setting every coefficient and each variable mean into the equation shown above, we can get the probability that the bank is securitizing and thus marginal effect of each variable.

$$P(Y=1) = \exp(\beta 1X1+\beta 2X2+\beta 3X3+\beta 4X4+\ldots\beta 10X10)/\ 1+\ \exp(\beta 1X1+\beta 2X2+\beta 3X3+\beta 4X4+\ldots\beta 10X10),$$ and

Marginal effect of X1 (Loans/Deposits) = $p(Y=1)\ (1-p(Y=0))\ \beta 1$

Marginal effect of X2 (Deposits Interest Expense/Total Deposits)= $p(Y=1)\ (1-p(Y=0))\ \beta 2$

Marginal effect of X3 = $p(Y=1)\ (1-p(Y=0))\ \beta 3$

When ROA is excluded, the best estimation among the four combinations is the first one with highest test power of 78.3%[22]. The following table demonstrates

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[22] The "Percent Correct Prediction" statistic assumes that if the estimated p is greater than or equal to .5 then the event is expected to occur and not occur otherwise. By assigning these probabilities 0s and 1s the Correct Prediction is constructed. The bigger the percentage of Correct Prediction is, the

how probability to securitize marginal effect is calculated given mean values of the independent variables for combination I.

Table 20: Calculation for p(Y=1) and Marginal Effect of the Significant Variables in Scenario I

	X (mean value)	β	β 'X(sum of β *X)	exp(β 'X)	p(Y=1) (%)	Marginal Effect (%)
Loan/Deposit	88.49	.057				1.31
Deposit Interest Expense/ Total Deposits	1.01	1.202	.59	1.81	64.42	27.55
Efficiency Ratio	60.30	-.134				-3.07

Thus, probability to securitize is 64.42% for a bank of all variables values equal to the means of 20 securitizing and 40 non-securitizing banks. Also, the sign and magnitude of the coefficients show that probability to securitize is positively related to loan/deposit and deposit interest expense/total deposit but negatively related to efficiency ratio.

The ratio of Loans/deposits recognizes a positive coefficient which describes that an increase in the ratio leads to higher chance to securitize. The marginal effect

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better the model.

shows that one percent increase in this ratio will lead to an increase of 1.31 percent in the possibility to securitize. As discussed above, the higher the ratio is the greater the liquidity risk will be. Thus this result confirms the hypothesis that a bank is more likely to be a securitizing bank when it faces higher liquidity needs.

A positive coefficient for deposit interest expense/total deposit ratio means probability of securitization increases with higher funding cost. A one percent increase in this funding cost measure is correlated to 27.55 percent increase of the probability to securitize. As discussed in section III, banks prefer to securitize when they face higher funding cost. This positive relation between deposit interest expense/total deposit ratio and probability of securitization confirms this hypothesis.

Efficiency ratio (non-interest expenses divided by total revenue) is negatively correlated with the securitization decision. This means that the more efficiently a bank operates, the higher the probability it will carry out securitization. A one percent increase in the efficiency ratio (i.e., the bank increasing its non-interest expense over revenue by 1%) will reduce the probability to securitize by 3.07%. This agrees with the expectation that "better-operated" banks are more capable and likely to securitize.

A significant positive coefficient is found for charge-off ratio in Scenario II. This positive sign means probability of securitization increases with higher charge-off on the loans. A higher ratio indicates poorer quality of the remaining assets on balance sheet. As discussed in section III, banks prefer to securitize their best assets and have its capital and deposits fund riskier assets. Obay also argues that in order to get a triple A rating on the repackaged loans, banks have an incentive to sell only their best assets, thereby leaving the FDIC insuring a riskier asset structure. The positive relation between charge-off ratio and probability of securitization confirms this hypothesis.

From the second part of the logistic test where ROA is included, Scenario VI has higher test power and the test result is shown below.

Table 21: Calculation for p(Y=1) and Marginal Effect of the Significant Variables in Scenario VI

	X (mean value)	β	β 'X(sum of β *X)	e^(β 'X)	p(Y=1) (%)	Marginal Effect (%)
Loans/deposits	88.49	.039				.86
ROA	1.24	3.220	.72	2.06	67.29	70.87
Efficiency ratio	60.30	-.213				-4.69

Given mean values of the three ratios, probability to securitize is 67.29%. The

decision is positive relation with loans/deposits, ROA and negative relation with efficiency ratio.

Again, loan/deposits ratio and efficiency ratio have similar marginal effect on the decision to securitize as previous test result.

ROA seems to be another important factor related to the decision whether or not to securitize here. A one percent increase will lead to 70.87% increase in the possibility to securitize. This result supports the hypothesis that banks with higher profit or better performance are more likely to securitize.

In summary, the test results show that the probability that a bank is securitizing is positively correlated to liquidity risk, funding cost and profitability, but negatively related to the efficiency ratio and loan quality.

D. Linear Regression to Explain the Degree of Securitizing Among Securitizing Banks

As discussed in Section III, the 53 securitizing banks are selected as sample group in the joint test of linear regression to determine the reasons for the degree of securitizing among securitizing banks. While the size factor is excluded in logistic

regression test, the log of total assets is applied as measurement of size in the linear regression test of degree of securitization.

Securitization volume as percentage of total assets is chosen to be dependent variable in linear regression test. The minimum is .1% while the maximum is 199%. The mean is 16.85 and the median is 4.57%. Table A6 in appendix shows us summary statistics on all variables.

Similar tests with charge-off/loans replaced by provision/loans or allowance/loans are carried out, both of the other two variables turn out to be insignificant. Furthermore, the test power is highest for the regressions with charge-off/loans presented above.

Though multicolinearity problem has been solved to certain extent, the non-normal distribution of the error terms limits the use of the findings to draw inferences about the underlying population. As shown by the summary statistics in appendix Table A6, the 53 banks in the study do not represent a random sample of the over two thousands BHCs. They, however, constitute an important mass in the banking industry. They control around 40% of all BHCs assets in the US.

Table 22: Linear Regression Test Result on Joint Effects of Variables

		Combination I.	Combination II.	Combination III.	Combination IV.
Characteristics	Constant	-287.573	-239.075	-281.498	-232.603
		(.01)***	(.02)**	(.01)***	(.01)***
Liquidity	Core Deposits/Total	-.240	NA	-.033	NA
	Deposits	(.31)		(.22)	
	Volatile Deposits/Total	NA	.019	NA	.018
	Deposits		(.52)		(.55)
	Loan/Deposit	.030	.001	.006	.003
		(.14)	(.96)	(.34)	(.93)
	Net Fed Funds	-1.46	-2.17	-1.57	-1.74
	Purchased/Assets	(.34)	(.22)	(.67)	(.52)
Portfolio	Charge-off/Loans	11.192	10.775	11.145	10.68
quality		(.01)***	(.06)*	(.01)***	(.01)***
Funding cost	Deposit Interest	5.913	5.463	5.954	5.501
	Expense/Total Deposits	(.01)***	(.01)***	(.01)***	(.01)***
Profitability	ROA	NA	NA	NA	NA
	ROE	4.519	4.227	.4.515	4.220
		(.01)***	(.01)***	(.01)***	(.01)***
Capital	Tier I Capital Ratio	-.566	-.497	NA	NA
adequacy ratio		(.24)	(.31)		
	Total Capital Ratio	NA	NA	-.525	-.444
				(.29)	(.38)
Efficiency	Non Interest	-.620	-.633	-.621	-.628
	Expense/Gross Return	(.23)	(.24)	(.23)	(.24)
	Real estate loans/total	.316	.255	.296	.233
	loans	(.36)	(.45)	(.39)	(.49)
Portfolio	Consumer & Industrial	.199	.215	.265	.238
composition	Loans/Total Loans	(.74)	(.73)	(.71)	(.79)
	Retail Loans/Total Loans	.113	.144	.013	.104
		(.77)	(.75)	(.81)	(.70)
Size	Ln (Total Assets)	7.347	6.392	7.062	6.108
		(.42)	(.88)	(.32)	(.64)
Test Power	R Square	59.51	38.50	22.84	48.11

As ROA has correlations with other variables, such as capital adequacy ratios and portfolio quality ratios and ROE turned to be significant in the joint test, ROA has been dropped in this test.

From the regression results, we can conclude that, portfolio quality (charge-off / loans), funding cost (deposit interest expense/total deposits), and profitability (ROE) have significant relation with securitization volume as percentage of total assets.

The findings are consistent with Wilcoxon test. However, variables that are found to be significantly linked to the securitization decision are not necessarily the ones that exert a significant weight in determining the amount of assets to be securitized. Liquidity risk and efficiency ratio don't have a significant relation with the level of securitization as they do on the decision to securitize.

Regulatory capital ratios turn out to be insignificant. This thesis hypothesizes lower capital adequacy ratio leads to higher degree of securitization based on the discussion of regulatory capital arbitrage and capital saving. However, it's found that banks were well above the minimum capital requirement of 8 percent. The average ratio of total capital and Tier I capital were 17.14 and 18.70 percent for 20 securitizing banks and 12.44 and 14.28 percent for non-securitizing banks by the end of year 2004. This may explain that why capital adequacy ratios don't promote higher securitization degree.

Portfolio composition measures are again insignificant in the linear test. As the dependent variable is set to be degree of all-type securitization as a sum, the relation between all types securitization volume and each type of loan's weight may be ambiguous.

Now let's have a close up at test result of "combination I" which gains highest test power. Holding other factors constant, a one percent increase in the ratio of Charge-off/Loans leaded to 11.192 percent of increase in securitization volume as percentage to total assets. This shows that higher credit risk of portfolio motivates the bank to securitize more as suggested in the hypothesis. Higher charge-off to loans ratio means poorer quality of the portfolio. The better the quality of repackaged assets are, the lesser the enhancement that is needed to realize an improved return and the better the acceptance of the issue among investors. Therefore, higher charge-off ratio representing lower quality of the remaining assets on balance sheet is likely to be associated with higher securitization volume.

The test result also shows that a one percent increase in ROE brings 4.519 percent increase in securitization degree. ROE has a significantly positive coefficient indicating that better performance or profit of the bank is associated with

more securitization. Obay gets the same result. It shows more profitable banks could be more capable to involve more in securitization. However, there is a strong possibility that causation flows in the other direction. Securitization can lead to recognition of portfolio volume through booking the excess spread on asset side. With my test, I cannot determine whether securitization brings profits to the bank or whether profitable banks securitize.

Funding costs are insignificant in relation with the decision whether or not to securitize yet they present a positive relation with securitization degree. A one percent increase in the ratio of Deposit Interest Expense/Total Deposits is linked to 5.913 percent increase in securitization volume. This follows the discussion that banks with higher funding costs seek to securitize as an alternative funding mechanism. As discussed in Section III, banks that lack of funds are likely to resort to intermediated funding which costs more than retail funding. These banks are encouraged to use securitization as another funding channel.

Another finding is that the size factor has insignificant relation with dependant variable, whereas Obay finds out that the asset size is positively correlated with securitization degree. This may due to high concentration of large banks in my sample group. As the 53 banks being tested are mainly largest in term of assets size,

the size factor among the large banks may have no significance. The fact that 75% of the securitizing banks are from the top 100 banks already proves size is crucial factor in securitization decision but not that important for securitization degree within these large banks.

In summary, degree of securitization increases with higher funding cost, credit risk of the loan portfolio and profitability. Liquidity risk, capital adequacy ratio efficiency, portfolio composition and size are found insignificant to have correlation with how much to securitize.

V. Conclusion and Insights for Future Research

A. Conclusion

Securitization activities are concentrated among top banks ranked by asset size. The assets most securitized are mortgage loan and credit card receivables.

Test findings have answered the three questions raised at the beginning of the paper

1. Do characteristics differ between securitizing and non-securitizing groups?

Yes, Securitizing and non-securitizing banks are statistically different at an overall level described by variables indicating characteristics of liquidity, portfolio quality, funding cost, capital adequacy, profitability and portfolio composition. At univariate level, securitizing and non-securitizing banks differ based on liquidity risk, portfolio quality, funding cost, profitability, and capital adequacy ratio. After controlling for the size factor, securitizing banks have higher liquidity needs (core deposit/total deposits; volatile deposit/total deposits; net fed funds purchased/assets), poorer portfolio quality (charge-off/ loans), higher profit and better performance (ROA), higher funding cost (deposit interest expense/total deposits), and lower

capital adequacy ratios (tier I and total risk-based capital ratio). All results agreed with what were expected by the theories of information asymmetry, regulatory arbitrage and bankruptcy cost avoidance. Obay (2000) only finds that capital adequacy ratio, liquidity needs and securitizable loan ratio are significantly different between the two groups. This thesis confirms his findings and further develops more robust results in portfolio quality, bank performance and profitability. I do the test based on size-matching sample groups in order to eliminate size effect on the variables which may cause the difference between my result and Obay's. As data in the sample does not follow normal distribution, Obay's comparison between means of the securitizing and non-securitizing banks may be problematic. Instead, I use the Wilcoxon test to compare the medians of the variables to get rid of the normal distribution constraint.

2. How do characteristics jointly related to the decision to securitize?

This thesis sheds light upon motives of securitization decision. All logistic tests show that higher liquidity needs (loans over deposits) combined with higher profitability (ROA) and lower efficiency ratio (i.e., higher efficiency) are linked to higher probability to adopt securitization activities. Also, some test also shows higher funding costs (deposit interest expense over total deposits) or poorer quality of the loan portfolio (charge-off/loans) has significant correlation with the use of

securitization.

Positive sign on the loan/deposits ratio is accordance with the hypothesis that higher liquidity needs are the motivates banks to securitize.

The positive relation between funding cost and securitization decision supports the discussion of funding cost saving in Section III. The result also follows the theory of information asymmetry resolving that securitizing funding cost is lower compared to deposit funding.

Defined as non-interest expense over gross revenue, the efficiency ratio measures the general well-being of operations. Its purpose is to evaluate the overhead structure of a financial institution. A lower ratio indicates lower cost and higher efficiency. Financial institutions with greater efficiency are more likely to be securitizing.

Charge-off/loans has a significantly positive sign. This result follows the intuition of incentive to securitize banks' best assets and hold riskier assets on their balance sheets since the return on these assets is generally higher than that of high-quality lower-risk assets. Obay also argues that in order to get a triple A rating

on the repackaged loans, banks have an incentive to sell only their best assets, thereby leaving the FDIC insuring a riskier asset structure.

ROA not only represents profitability but also a bank performance. The positive relation follows the intuition that securitization requires the bank to be sophisticated with good performance. From the other hand, ROA could be substantially augmented by removing the securitized assets from their books and generating profits with the proceeds.

3. Is there a linear relationship between degree of securitization and the characteristics?

Yes, the linear test of the degree of securitization is not as robust as the Wilcoxon or logistic test. Nevertheless, profitability, funding cost and portfolio quality are jointly correlated with securitization volume. Higher funding cost and ROE, are associated with higher degree of securitization, which agrees with the Obay's finding. Whereas the positive relation between securitization degree and charge-off over loans is contrary to Obay's finding. As suggested by information asymmetry and regulatory arbitrage theories, banks benefit from securitizing their best assets and keeping the risky assets on the balance sheet. Following this

intuition, a higher charge-off ratio is more likely to be found in securitizing banks as the remaining assets are of poor quality. Therefore, the test result in the paper agrees with the theories I reviewed.

From this thesis, bankers could learn that liquidity needs, funding cost, profitability and efficiency ratio are significantly correlated with securitization. Thus, when they face increase of loans over deposits ratio, charge-off over loans or decrease of efficiency ratio, securitization would be considered especially the bank is large enough to bear the fixed cost.

Also, regulators could gain a close-up on the significant motives for securitization and this will facilitate monitoring of securitizing banks.

Basel II aims to combat regulatory arbitrage that could be easily achieved under Basel I. Regulators are putting on more emphases on operational and capital requirements on securitization as Basel II includes a whole section about treatments of securitization. The new accord treats exposures very unequally based on exposure characteristics and it treats banks unequally depending on sophistication of risk management systems. A better understanding of how liquidity or efficiency ratio are related to the securitization decision and degree will aid regulators to assess securitizing bank's report on risk exposure and operating performances.

In summary, the test results corresponding to the three questions support the argument of saving regulatory capital, increasing liquidity risk, lower funding cost and resolving information asymmetry. Lower capital adequacy ratios for securitizing banks support the capital arbitrage theory. However, the ratio turns to be insignificant on decision of securitization and needs further investigation.

B. Future Research

I apply weights of different loans as measurement of portfolio composition, but hardly find any relation with securitization volume in linear regression and securitization decision logistic regression. As portfolio composition could be presented by other measures, further tests may be carried out to further examine the relation between portfolio composition and securitization.

A major shortcoming of this thesis is that data in all tests are carried from the same time period giving rise to confusion between cause and effect. For example, a bank with higher funding cost ratio in previous period may decide to securitize more in next period. If in the next period, securitization is carried out, it will release the bank's debt constraint. This relation would be reflected with funding cost

figures in current period and securitization decision for next period. Thus, similar tests should be done on a time series basis.

Tests carried out in this thesis reveal certain correlations between securitization decision/degree and bank characteristics from the angle of motives for securitization. The effect that securitization plays on bank's ratios could be further tested in separate tests. For example, higher profitability is found to be correlated with higher securitizing volume. However, the direction of cause and effect has not been worked out yet. In other words, how to measure the impact of securitization on banks' profitability remains as question for further research.

This thesis uses three default risk measures, i.e. charge-off/loans, provision/loans and allowance/loans as indicators of loan quality on the balance sheet. However, those ratios could not exactly convey that how "bad" was the asset quality as implied by information asymmetry theory. Level of information asymmetry depends on how hard it is to predict the default risk of the assets rather than the absolute value of default risk. For example, credit card loans have high default risk but are preferred to be securitized as one major ABS.

Those aspects of future research addressed above will further discover the

mutual impacts between bank characteristics and their securitization activities. More accurate measures on the characteristics and a time series method will bring more robot test results revealing the relation between characteristic and securitization decision.

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Appendix

Table A1: Variables Selected from the Bank Holding Company Performance Report

Liquidity Risk

Term	Core deposit/ Loans	Volatile Deposits/ Deposits	Reserves/ Deposits	Net Federal Funds Purchased/ Assets	Loans/ Deposits
Data	**Schedule HC-E of 1. a-d and 2. a-d. / Schedule HC-C item 12**	**Schedule HC-E Memoranda item 1, 2, and 4, HC-E 1e, 2e, HC item 14 / HC item 13 a and b**	**Schedule HC item 1-3 / HC item 13 a and b**	**Schedule HC item 14b - 14a / HC item 12**	**HC item 13 a and b / HC-C item 12**

Portfolio Quality

Term	Charge-off /Loans	Allowances/Loans	Provision/Loans
Data	**Schedule HI-B item 9 column A / HC-C item 12**	**Schedule HC item 4c/ HC-C item 12**	**Schedule HI item 4 / HC-C item 12**

Funding Cost

Term	Deposit Interest Expense /Total Deposits
Data	**Schedule HI item 2 a and b / HC item 13 a and b**

Regulatory Adequacy Ratio

Term	Total Risked-based Capital Ratio	Tier I Risk-based Capital Ratio (
Data	Schedule HC-R item 33	Schedule HC-R item 32

Profitability and Efficiency Ratio

Term	Return on Asset (Net income / Net Total Assets)	Return on Equity (Net income / Total Equity)	Non-Interest Expense /Gross Revenue (non-interest income + interest income)
Data	Schedule HI item 13/ Schedule HC item 12	Schedule HI item 13/ Schedule HI item 28	Schedule HI item 2 a and b / HI item 1 a

Portfolio Composition

Term	Real Estate Loans/Total Loans	Consumer & Industrial Loans/ Total Loams	Retail Loans/ Total Loans
Data	Schedule HC-C item 1 / Schedule HC-C item 12	Schedule HC-C item 4 / Schedule HC-C item 12	Schedule HC-C item 6 / Schedule HC-c item 12

Size

Term	Log (Net Total Assets)
Data	Log (Schedule HC item 12)

Table A2: Listing of Banks in the Study: 53 Securitizing Banks

Name	Assets ($mn)	Securitization volume ($mn)	% of Assets
J.P. MORGAN CHASE & CO.	1,138,469.00	95,842.00	8.42
BANK OF AMERICA CORPORATION	1,089,312.37	86,754.23	7.96
CITICORP	899,597.00	339,609.00	37.75
WACHOVIA CORPORATION	436,698.00	61,141.00	14.00
WELLS FARGO & COMPANY	421,549.00	202,483.00	48.03
TAUNUS CORPORATION	321,376.00	27,029.00	8.41
U.S. BANCORP	192,844.00	396.00	0.21
HSBC NORTH AMERICA INC.	155,257.98	4,739.21	3.05
NATIONAL CITY CORPORATION	136,372.58	3,376.00	2.48
SUNTRUST BANKS, INC.	127,785.99	57,445.72	44.95
COUNTRYWIDE FINANCIAL CORPORATION	104,388.45	207,974.31	199.23
STATE STREET CORPORATION	100,526.52	1,634.51	1.63
FIFTH THIRD BANCORP	98,293.07	1,497.77	1.52
BANK OF NEW YORK COMPANY, INC., THE	93,692.29	92.00	0.10
KEYCORP	88,086.35	5,125.03	5.82
REGIONS FINANCIAL CORPORATION	83,630.86	1,965.89	2.35
PNC FINANCIAL SERVICES GROUP, INC., THE	77,310.14	2,843.01	3.68
MBNA CORPORATION	62,051.86	85,672.35	138.07
SOUTHTRUST CORPORATION	53,888.17	550.73	1.02
M&T BANK CORPORATION	52,886.90	8,195.86	15.50
CHARLES SCHWAB CORPORATION, THE	45,934.70	290.10	0.63
POPULAR, INC.	42,856.00	4,297.00	10.03
BANCWEST CORPORATION	41,413.14	105.26	0.25
MARSHALL & ILSLEY CORPORATION	39,006.41	899.09	2.30
CIBC DELAWARE HOLDINGS INC.	37,427.65	1,203.00	3.21
MELLON FINANCIAL CORPORATION	35,238.85	3,351.85	9.51
HUNTINGTON BANCSHARES INCORPORATED	31,807.49	197.48	0.62
ZIONS BANCORPORATION	30,731.04	447.36	1.46
COMMERCE BANCORP, INC.	28,443.36	35.63	0.13
FIRST HORIZON NATIONAL CORPORATION	28,296.53	8,610.05	30.43
COMPASS BANCSHARES, INC.	27,850.31	1,637.27	5.88
GREENPOINT FINANCIAL CORP.	26,961.95	3,524.35	13.07
NATIONAL COMMERCE FINANCIAL CORPORATION	24,211.36	302.32	1.25

HIBERNIA CORPORATION	21,353.37	78.41	0.37
DORAL FINANCIAL CORPORATION	14,983.40	10,715.61	71.52
MERCANTILE BANKSHARES CORPORATION	14,303.02	125.95	0.88
SOUTH FINANCIAL GROUP, THE	13,649.52	20.68	0.15
FIRST NATIONAL OF NEBRASKA, INC.	12,074.86	2,577.33	21.34
INTERNATIONAL BANCSHARES CORPORATION	9,440.64	30.97	0.33
R&G FINANCIAL CORPORATION	9,188.85	3,932.31	42.79
FRANKLIN RESOURCES, INC.	8,220.02	791.24	9.63
FIRST BANKS, INC.	7,566.41	23.15	0.31
SUSQUEHANNA BANCSHARES, INC.	7,449.86	516.22	6.93
UNITED BANKSHARES, INC.	6,289.65	28.20	0.45
EAST WEST BANCORP, INC.	5,567.84	65.51	1.18
IRWIN FINANCIAL CORPORATION	5,388.75	591.75	10.98
MB FINANCIAL, INC	5,069.41	8.50	0.17
AMCORE FINANCIAL, INC.	4,878.73	135.27	2.77
MAINSOURCE FINANCIAL GROUP	1,556.71	500.59	32.16
FARMERS & MERCHANTS INVESTMENT, INC.	1,404.49	274.16	19.52
AMERICAN NATIONAL CORPORATION	1,370.23	63.78	4.65
LAURITZEN CORPORATION	1,166.10	462.04	39.62
UNITED NATIONAL CORPORATION	1,043.42	47.71	4.57

Three Observations Excluded as Extreme Values

ASSOCIATED BANC-CORP	16,175.65	0.40	0.00
W HOLDING COMPANY, INC.	13,478.86	0.54	0.00
VIRGINIA COMMERCE BANCORP, INC.	1,106.54	0.32	0.03

Table A3: Listing of Banks in the Study: 53 Non-securitizing Banks

Name	Assets ($mn)
CITIZENS FINANCIAL GROUP, INC.	134,436.10
ABN AMRO NORTH AMERICA HOLDING COMPANY	134,073.16
BB&T CORPORATION	97,880.40
COMERICA INCORPORATED	53,273.02
AMSOUTH BANCORPORATION	49,892.47
UNIONBANCAL CORPORATION	47,041.20
NORTHERN TRUST CORPORATION	41,110.02
HARRIS FINANCIAL CORP.	39,939.16
BANKNORTH GROUP, INC.	29,003.19
NORTH FORK BANCORPORATION, INC.	27,502.81
UTRECHT-AMERICA HOLDINGS, INC.	25,903.72
SYNOVUS FINANCIAL CORP.	24,395.88
NEW YORK COMMUNITY BANCORP, INC.	23,671.32
RBC CENTURA BANKS, INC.	19,975.47
TD WATERHOUSE GROUP, INC.	19,602.53
COLONIAL BANCGROUP, INC., THE	18,227.24
WEBSTER FINANCIAL CORPORATION	17,810.52
SKY FINANCIAL GROUP, INC.	14,665.16
BOK FINANCIAL CORPORATION	14,435.56
COMMERCE BANCSHARES, INC.	14,153.30
CITY NATIONAL CORPORATION	13,982.61
CBI-KANSAS, INC.	13,829.53
FIRST CITIZENS BANCSHARES, INC.	13,019.10
FBOP CORPORATION	12,912.59
TCF FINANCIAL CORPORATION	12,114.08
INVESTORS FINANCIAL SERVICES CORP.	10,793.39
VALLEY NATIONAL BANCORP	10,630.85
BANCORPSOUTH, INC.	10,613.13
FULTON FINANCIAL CORPORATION	10,568.82
PEOPLE'S MUTUAL HOLDINGS	10,564.71
FIRSTMERIT CORPORATION	10,164.48
CULLEN/FROST BANKERS, INC.	9,898.80
WILMINGTON TRUST CORPORATION	9,667.50
ESB ACQUISITION CORP.	9,634.62
BANK OF HAWAII CORPORATION	9,602.51

OLD NATIONAL BANCORP	8,982.40
HUDSON UNITED BANCORP	8,833.76
DISCOUNT BANCORP, INC.	8,600.03
TRUSTMARK CORPORATION	8,150.63
WHITNEY HOLDING CORPORATION	8,075.77
SANTANDER BANCORP	7,965.83
CITIZENS BANKING CORPORATION	7,658.68
FIRSTBANK HOLDING COMPANY	7,274.52
GREATER BAY BANCORP	7,126.50
ARVEST BANK GROUP, INC.	7,024.17
FIRST MIDWEST BANCORP, INC.	6,934.57
UMB FINANCIAL CORPORATION	6,872.26
SOUTHWEST BANCORPORATION OF TEXAS, INC.	6,633.48
PROVIDENT FINANCIAL SERVICES, INC.	6,541.45
CENTRAL BANCOMPANY	6,527.14
PROVIDENT BANKSHARES CORPORATION	6,397.84
NEWALLIANCE BANCSHARES, INC.	6,283.30
FIRST COMMONWEALTH FINANCIAL CORPORATION	6,258.71

Table A4: Logistic Test on Single Variables

Variables/Scenarios	On single variable	Coefficient and significance
Core Deposit/Total Deposits	Significant	-.027 (.084)*
Volatile Deposit/Total Deposits	Significant	.033 (.072)*
Reserves/Deposits	Insignificant	.003 (.332)
Loan/Deposits	Significant	.059 (.004)***
Net Fed Funds Purchased/Assets	Insignificant	-.092 (.253)
Deposit Interest Expense/Total Deposits	Significant	2.01 (.023)**
ROE	Insignificant	.014 (.51)
ROA	Significant	1.933 (.035)**
Charge-off/loans	Significant	1.990 (.045)**
Provision/loans	Significant	3.880 (.089)*
Allowance/loans	Insignificant	.128 (.409)
Tier I Capital Ratio	Insignificant	.047 (.167)
Total Capital Ratio	Insignificant	.046 (.180)
Efficiency ratio	Significant	-.093 (.004)***
Real Estate Loans/Total Loans	Insignificant	1.305 (.497)
Consumer & Industrial Loans/Total Loans	Insignificant	.252 (.942)
Retail Loans/Total Loans	Insignificant	1.345 (.486)

Table A5: Summary Statistics on Independent Variables and Dependent Variable for 53 securitizing banks

	Mean	Standard Error	Median	Standard Deviation	Kurtosis	Skewness	Minimum	Maximum
Core deposits/total deposits %	73.62	3.00	81.49	22.45	3.31	-1.88	2.43	99.69
Net federal fund purchased/assets %	1.38	.42	.65	3.16	6.78	2.18	-2.90	15.49
Loan/deposit %	94.69	3.35	98.19	23.49	3.91	-1.55	9.51	140.20
Volatile deposits/total deposits %	31.96	2.41	27.90	16.92	3.14	1.54	7.99	91.10
Reserves /deposits %	66.09	46.52	38.92	348.16	24.88	4.91	8.98	143
Charge-off/loans %	.40	0.07	0.25	.20	5.37	4.01	0.00	3.48
Provisions/loans %	. 28	.06	.19	.45	18.67	3.25	0	2.77
Allowance/loans %	1.29	.07	1.28	.54	20.19	1.16	.18	3.55
Deposit interest expense/total deposits%	55.35	2.62	56.17	19.63	1.25	-.80	1.03	93.07

Table A5: Summary Statistics on Independent Variables and Dependent Variable for 53 Securitizing Banks
Continued

	Mean	Standard Error	Median	Standard Deviation	Kurtosis	Skewness	Minimum	Maximum
Tier I risk based capital %	12.71	1.54	9.59	11.57	19.24	4.06	-4.65	76.27
Total risk based capital %	15.07	1.51	12.16	11.30	18.61	3.95	-4.65	76.36
ROA %	1.36	.23	.97	1.77	29.41	5.16	.14	12.66
ROE %	13.42	1.59	57.33	11.58	.25	3.47	7.52	84.43
Efficiency ratio %	58.50	1.61	57.04	12.07	0.22	-.05	26.50	84.43
Real estate loans/loans %	56.70	3.05	58.24	22.17	0.33	-.50	0.00	99.12
Consumer & industrial loans/loans %	16.55	1.12	17.03	8.17	-.05	-.24	0.00	33.84
Retail loans/loans %	13.53	2.23	9.56	16.27	10.40	2.90	0.00	88.26
Size	17.16	.23	17.20	1.73	-.21	.03	13.85	20.85
Securitization degree %	16.85	4.75	4.57	34.59	16.96	3.86	0.10	199.23